

CLASS
10

CBSE



**PHYSICS
WALLAH**

15 **SAMPLE QUESTION PAPERS**

NEW PATTERN

As per Latest CBSE SQP (Dated 30 July 2025)

SCIENCE

With CBSE SQP, 2024 & 2025 Solved Papers

2026
EXAMINATION

Additional Features

- **13** Cheat Sheets (Mindmap)
- **111** Most Probable Questions
- **14** Answering Templates
- **3** SQPs with Marks Breakdown



CONTENTS

Scan for Latest
Syllabus &
Upcoming
CBSE SQPs



❖ Frequently Asked Questions	ix
❖ CBSE Board Exam 2026: Two-Exam Scheme Decoded	x–xi
❖ Instructions for Filling the OMR Sheet	xii–xiii
❖ Self Assessment Sheet	xiv– xvi
❖ Exam Ready: Answering Templates that Score	xvii–xxii

I. Cheat Sheets

1. Chemical Reactions and Equations	1
2. Acids, Bases and Salts	2–3
3. Metals and Non-metals	4
4. Carbon and its Compounds	5–6
5. Life Processes	7–8
6. Control and Coordination	9–10
7. How do Organisms Reproduce?	11–13
8. Heredity	14–15
9. Light - Reflection and Refraction	16
10. The Human Eye and The Colourful World	17
11. Electricity	18
12. Magnetic Effects of Electric Current	19
13. Our Environment	20

II. 111 Most Probable Questions

21–33

III. Sample Question Papers

1. Sample Question Paper-1 (Easy)	35–42
2. Sample Question Paper-2 (Easy)	43–48
3. Sample Question Paper-3 (Easy)	49–55
4. Sample Question Paper-4 (Easy)	56–61

5. Sample Question Paper-5 (Medium)	62–70
6. Sample Question Paper-6 (Medium)	71–77
7. Sample Question Paper-7 (Medium)	78–85
8. Sample Question Paper-8 (Medium)	86–92
9. Sample Question Paper-9 (Hard)	93–101
10. Sample Question Paper-10 (Hard)	102–109
11. Sample Question Paper-11 (Hard)	110–116
12. Sample Question Paper-12 (Hard)	117–124

IV. Explanations

1. Sample Question Paper-1	127–135
2. Sample Question Paper-2	136–142
3. Sample Question Paper-3 (Handwritten through QR code)	143
4. Sample Question Paper-4 (Handwritten through QR code)	143
5. Sample Question Paper-5	144–152
6. Sample Question Paper-6	153–160
7. Sample Question Paper-7	161–168
8. Sample Question Paper-8 (Handwritten through QR code)	169
9. Sample Question Paper-9	170–178
10. Sample Question Paper-10	179–186
11. Sample Question Paper-11	187–193
12. Sample Question Paper-12 (Handwritten through QR code)	194

V. CBSE Solved Papers

1. CBSE Sample Question Paper (Issued by CBSE on 30 th July, 2025)	195–211
2. CBSE Solved Paper 2024	212–222
3. CBSE Solved Paper 2025	223–234

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Frequently Asked Questions



Scan for More FAQs

1

Question: Has the paper pattern changed in CBSE SQP 2025-26 compared to 2025 Board Paper?

Answer: Yes. In 2025 Board Paper, questions from Biology, Chemistry, and Physics were intermixed throughout the paper, whereas in CBSE SQP 2025-26, the paper is divided into clear subject-wise sections:

Section A: Biology

Section B: Chemistry

Section C: Physics

2

Question: Are the total number of questions, total marks and duration the same in CBSE SQP 2025-26 and 2025 Board Paper?

Answer: Yes. Both consist of 39 questions, carry a total of 80 marks, and have a duration of 3 hours.

3

Question: Is the subject-wise marks distribution in the CBSE SQP 2025-26 the same as that of the 2025 Board Paper?

Answer: Yes, the subject-wise marks distribution in the CBSE SQP 2025-26 is the same as that of the 2025 Board Paper. The distribution of marks across the three Science subjects is as follows:

Biology: 30 marks

Chemistry: 25 marks

Physics: 25 marks

4

Question: Is there any change in the assessment scheme for the current academic session (2025-26)?

Answer: No. There is no change in the assessment scheme for 2025-26. It remains the same as that of the academic session 2024-25.

5

Question: Has the format of case-based questions changed in the CBSE SQP 2025-26 compared to 2025 Board Paper?

Answer: Yes. In CBSE SQP 2025-26, the format of case-based questions has been updated to include a combination of objective and descriptive questions. In contrast, the 2025 Board Paper featured only descriptive case-based questions. This change aligns with CBSE's focus on competency-based assessment and more diverse question formats.

6

Question: Do examiners deduct marks for exceeding the word limit and spelling mistakes, especially in the language papers?

Answer: No marks are deducted for exceeding the word limit. Marks for spelling mistakes and other errors are deducted in the Language Papers.

7

Question: Will questions be asked from the Board's sample paper?

Answer: Sample question papers help you know the design, pattern and types of questions. Questions in the examination may be from any part of the syllabus. So, prepare thoroughly from the entire syllabus

8

Question: How can we obtain a copy of the Answers Book of Class 10th exam?

Answer: Applicant may apply for obtaining photocopy of answer books by paying prescribed processing charges as per time frame set by the Board. For details please see our website www.cbse.nic.in at the time of declaration of results.

CBSE Board Exam 2026: Two-Exam Scheme Decoded

1. What is the major change in Class X Board exams from 2026?

Ans: Starting in 2026, CBSE will conduct two Board exams per year for Class X, one main examination and one for improvement, if desired. This aims to offer students more flexibility and reduce pressure.

2. Why are two Board exams being introduced?

Ans: This is in line with the National Education Policy (NEP) 2020, which emphasizes holistic assessment, focus on core competencies, and reducing rote memorization.

Two Board exams aim to eliminate the high-stress/high-stakes nature of a single final exam and provide students more opportunities to improve.

3. Can I appear for both exams in the same year?

Ans. Yes, you can appear in both exams within the same school year:

First Board Examination (Main Exam)

You must appear in the first Board Examination, as it is mandatory for all students.

Eligible categories:

- ☐ Fresh students of Class X
- ☐ Students in Compartment (2nd Chance)
- ☐ Students repeating the year (Essential Repeat)
- ☐ Students appearing for improvement of previous performance

Second Board Examination

You can appear in the second examination in the following cases:

- ☐ Improvement: For up to 3 subjects to improve your score.
- ☐ Compartment: If you were placed in Compartment in the first phase exam.
- ☐ Improvement + Compartment: You can appear for both in May.
- ☐ Improvement for the students passed by the replacement of the subject.

Note: You are not allowed to take the second examination if you didn't appear in at least 3 subjects during the first examination. In such cases, you'll fall under the "Essential Repeat" category and have to wait until the next year.

4. When will the exams be held?

Ans. First Phase Examination: 17 February to 6 March 2026

Second Phase Examination: 5 May to 20 May 2026

5. Is it mandatory to attempt the First Phase exam for all students?

Ans. Yes, it is mandatory to attempt the First Phase Exam for all Class X students. It will be treated as the main board examination.

6. Is it mandatory to attempt the Second Phase exam? Who can appear for it?

Ans. No, the May exam is not mandatory. It is an optional attempt meant for:

- ☐ Students who want to improve their scores
- ☐ Students who were absent or could not perform well in the February exam
- ☐ Students who fail in one or more subjects in the first phase

7. Will the syllabus remain the same for both first and second examinations?

Ans. Yes, the syllabus will be the same for both the first and second examinations. Both examinations will be based on the full syllabus prescribed for the academic year.

8. Is it necessary to opt for the second examination at the time of filling the LOC for the first examination to be eligible for it?

Ans. Yes, you must opt for the second examination while filling the LOC (List of Candidates) for the first examination to be eligible for it.

As per CBSE policy:

- ☐ Filling the LOC for the first examination is mandatory.
- ☐ At that time, you must indicate whether you want to appear for the second examination.
- ☐ If you don't select this option, you cannot appear in the second examination later.
- ☐ No new name will be added to the LOC of the second examination.
- ☐ After the first exam result, you can opt out, but not opt in if you didn't choose the second examination earlier.

Tip: Always opt for the second examination—just in case.

9. Can I take admission in Class XI after the first examination result?

Ans. Yes, provisional admission to Class XI is allowed after the first examination result.

- ☐ Your performance of main/first examinations will be available in DigiLocker and can be used for admission to class XI if the student does not wish to appear in second examinations for improvement.
- ☐ Students not qualified in the main examination will be allowed provisional admission in Class XI and based on the result of the second examination, their admission will be confirmed.

10. Are the dates fixed for all subjects?

Ans. Major subjects like Maths, Science, Social Science, Hindi, and English will have fixed exam days.

Examination of Regional and Foreign Languages will be done in one go on a single day.

Examination of remaining subjects will be conducted 2 times to 3 times based on the choices of the students on 2 or 3 days.

11. Can I change my subjects after LOC Submission?

Ans. No. Once the List of Candidates (LOC) is submitted, no subject changes will be allowed except permitted as per policy.

12. Will special exams be conducted in case of emergencies?

Ans. No. Special exams will not be conducted under any circumstances.

13. When will the results be declared?

Ans. Results of the first examinations will be declared in the month of April.

Results of the second examinations will be declared in the month of June.

14. What details will be shown in the final Mark Sheet cum Passing Certificate?

Ans. The Mark Sheet cum Passing Certificate will include the following:

- ☐ Marks obtained in the first examination
- ☐ Marks obtained in the second examination (if attempted)
- ☐ Marks from the Practical/Internal Assessment
- ☐ Grades for each subject
- ☐ The better of the two marks (first or second examinations) will be clearly mentioned.

15. Will I get marksheets for both exams?

Ans. You'll receive your passing documents and merit certificates after the results of second examinations. Your first attempt's performance will be available in DigiLocker for Class XI admissions.

16. If I score well in the first examination, do I still need to appear in the second one?

Ans. No. If you're satisfied with your performance, you don't need to appear again. The second exam is optional for improvement.

17. Will Practical/Internal Assessment also be conducted twice?

Ans. No, Practical/Internal Assessment will be conducted only once.

EXAM READY: ANSWERING TEMPLATES THAT SCORE

Multiple Choice Question Type

Q. The oxide which can react with HCl as well as KOH to give corresponding salt and water is

(a) CuO

(b) Al_2O_3

(c) Na_2O

(d) K_2O

Ans.

Question no.: _____

Answer: (Correct Ans Key)

- Evaluate each option systematically by understanding the key terms and concepts involved.
- After identifying the correct option, write only the corresponding correct answer key.
- There is no need to provide the justification or explanation for this.

Comparison Type

Q. How is the movement of leaves of a sensitive plant different from the downward movement of the roots?

Ans.

The table outlining the difference between _____ and _____

Aspect	Leaves of Sensitive Plant	Downward Movement of Roots
Type of Movement	_____	Geotropism
Dependency	_____	_____
Mechanism	Facilitated by changes in water content within cells.	_____
Trigger	_____	Environmental stimulus (gravity)

In comparison / differentiate / distinguishing type questions, start with a general statement introducing the comparison between the two types of movements. This sets the context and keeps the examiner aware of the focus of your answer.

Avoid paragraphs*: Use a tabular format to compare both types of movements.

Use **comparative language in pairs** to indicate that you're comparing two different things.

Each point should address a different aspect such as **type of movement, dependency, mechanism, and trigger**.

**Use a paragraph format if the comparison-type question awards fewer marks (like 2 marks) or if there are only one or two key differences to mention. You can use the following connecting phrases to make the comparison flow smoothly in a paragraph form: "In contrast", "While", "Unlike", "On the other hand", "Additionally", "However", "Whereas".*

Concept Recall-Justification Type

Q. Name the type of chemical reaction in which calcium oxide reacts with water. Justify your answer by giving balanced chemical equation for the chemical reaction.

Ans.

Calcium oxide (CaO), commonly known as _____, reacts vigorously with water. This reaction produces _____.

The balanced chemical equation for this reaction is as follows:

In this reaction, calcium oxide and water combine to form a _____ product. Such a reaction, _____ reaction.

Introduction: Start by introducing the reactants and products clearly. Ensure to use the correct chemical names and chemical formulae.

Balanced chemical equation: Provide the balanced equation clearly and label each component (reactants and products). Ensure that the equation is balanced in terms of the number of atoms for each element on both sides.

Justification: Clearly identify the type of reaction and provide justification. Use headings and bullet points if needed to organize your answer well.

Analyzing Type

Q. Plants → Deer → Lion

In the given food chain, what will be the impact of removing all the organisms of second trophic level on the first and third trophic level? Will the impact be the same for the organisms of the third trophic level in the above food chain if they were present in a food web? Justify.

Ans.

According to the given food chain,
The first trophic level is represented by: _____
The second trophic level is represented by: _____
The third trophic level is represented by: _____

The impact of removing all the organisms of the second trophic level (_____) would be:

Plants may _____.
Lions would _____.

_____ (Yes/No), If lions were part of a food web instead of a simple chain, the impact

Step-by-Step Analysis: Identify the elements in the question (such as trophic levels in this case) and analyze the relationships between them.

Consider all possible impacts when changes occur (like removing a trophic level).

Justify with Reasoning: Justify your points using logic or scientific principles. If the question asks for comparison (like the impact food chain vs. a food web), explain why one scenario is different from the other.

Conceptual Understanding and Application

Q. Name and state the rule to determine the direction of a:

- (i) magnetic field produced around a current carrying straight conductor.
- (ii) force experienced by a current carrying straight conductor placed in a magnetic field which is perpendicular to it.

Ans.

- (i) The rule to determine the direction of the magnetic field produced around a current carrying straight conductor is _____.

According to this rule, _____.

- (ii) The rule to determine the direction of the force experienced by a current-carrying straight conductor placed in a magnetic field perpendicular to it is _____.

According to this rule, _____.

In subjective questions where answer is of one line or one word, it is better to write the whole sentence.

If question demands explanation or application of any rule then start your answer with "According to _____".

Factual-Function Type

Q. State one role of each of the following in human digestive system:

- (i) Hydrochloric acid
- (ii) Villi
- (iii) Anal Sphincter
- (iv) Lipase

Ans.

The role of _____:

- (i) Hydrochloric acid: Creates an acidic environment which facilitates the action of the enzyme pepsin.
- (ii) Villi: _____.
- (iii) Anal sphincter: _____.
- (iv) Lipase: _____.

- Begin with an introductory sentence.
- In this case, the question directly asks for functions, so the introduction can be skipped.
- If needed in other such questions, you can write something like this.

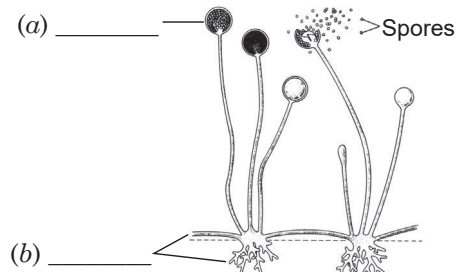
Start with the subject (in this case "Hydrochloric acid") and directly state its role (in creating an acidic environment for enzyme action.) Follow this for other components *Villi*, *Anal sphincter*, *Lipase*, and ensure you use bullets/underline for highlighting these components.

Diagram-Creation Type

Q. Draw a diagram showing spore formation in *Rhizopus* and label the (a) reproductive and (b) non-reproductive parts. Why does *Rhizopus* not multiply on a dry slice of bread?

Ans.

Rhizopus reproduces through _____.



Rhizopus does not multiply on dry bread because _____.

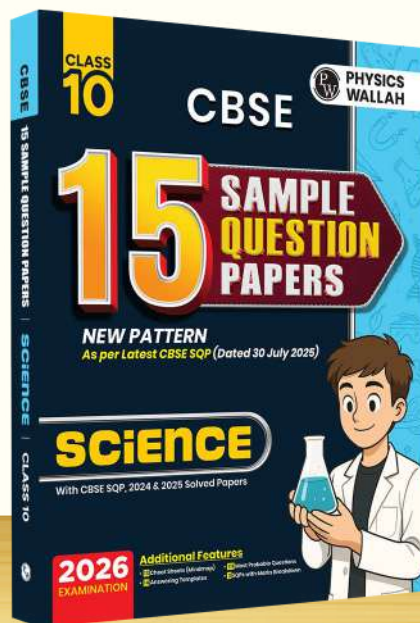
Start with a brief explanation about the subject (if required).

Draw a clear diagram and label all necessary parts as per the question ((a) reproductive and (b) non-reproductive in this case).

If the question asks for reasoning, such as why something happens (e.g., why *Rhizopus* doesn't multiply on dry bread), provide a short and scientifically accurate explanation.

Class 10 Ki Taiyaari Ho Ab Aur Bhi Aasan!

- 1 Topper's Explanations
 - 2 Mistake 101: What not to do!
 - 3 Self Assessment Sheet
 - 4 Frequently Asked Questions
 - 5 CBSE Solved Papers 2024 & 2025
 - 6 Answer Writing & OMR Filling Tips
 - 7 CBSE Past 5 Years' Paper Trend Analysis
 - 8 Cheat Sheets (Mind Maps)
 - 9 111 Most Probable Questions
 - 10 Level-wise (Easy, Medium, Hard) Sample Papers
 - 11 CBSE Board Exam 2026: Two-Exam Scheme Decoded
 - 12 8 Sample Papers with detailed explanations (Step-wise Marking)
 - 13 4 Sample Papers with handwritten explanations through QR code
 - 14 Question Typology, Evolving Trends in CBSE Exam Patterns, Preparation Guide
 - 15 CBSE Sample Question Paper 2025-26 (with CBSE Marking Scheme)



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CHAPTER-1

CHEMICAL REACTIONS AND EQUATIONS



Cheat Sheet

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Types

- **Combination reaction:** When 2 or more reactants combine to form single product
E.g.: $2\text{Na(s)} + \text{Cl}_2\text{(g)} \rightarrow 2\text{NaCl(s)}$ **CBSE 2024, 2020**
- **Decomposition reaction:** Single reactant breaks down into 2 or more products. It is of following types: **CBSE 2025, 2020**

1. Thermal Decomposition, by heat



2. Photo Decomposition, by light



3. Electrolytic decomposition by electricity



- **Single displacement reaction:** More reactive element displaces less reactive elements from its salt solution.



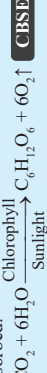
- **Double displacement reaction:** Exchange of ion takes place between reactants. **CBSE 2025, 2022 Term-I, 2020**



- **Exothermic Reaction:** Reaction in which heat is released. **CBSE 2024, 2022 Term-I, 2020**

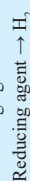
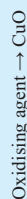
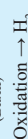


- **Endothermic Reaction:** Reaction in which heat is absorbed. **CBSE 2023**



Redox Reactions **CBSE 2022 Term-I**

- **Oxidation:** (a) Addition of O_2 (b) Removal of H_2
- **Reduction:** (a) Addition of H_2 (b) Removal of O_2
- **Oxidising agent:** Agent which oxidises others and itself gets reduced.
- **Reducing agent:** Agent which reduces others and itself gets oxidised. **CBSE 2025, 2023**



Chemical Reactions And Equations

Chemical Equations

Represented as

Type of Change & Characteristics

Effects of Oxidation

- (a) **Corrosion:** Degradation of metals.

E.g.: Rusting of iron ($\text{Rust Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$), Tarnishing of Ag.

Prevention:

- Galvanisation
- Painting, oiling, etc.

- (b) **Rancidity:** Oxidation of foods containing oils and fats, causing smell and taste change.

Prevention:

- Flushing of Nitrogen gas
- Refrigeration

CBSE 2025, 2024, 2022 Term-I

- It is the representation of chemical reaction in symbols and it needs to be balanced.
E.g.: $2\text{Mg(s)} + \text{O}_2\text{(g)} \rightarrow 2\text{MgO(s)}$

- As per law of **conservation of mass**, total mass of the elements present in the products of a chemical reaction has to be equal to the total mass of the elements present in the reactants.

CBSE 2025

- **Chemical Change:** Reactants transform into products. Generally irreversible.

E.g.: Curdling of milk

- **Physical Change:** No new substances are formed

Generally reversible.

E.g.: Melting of ice

- **Evolution of gas**



- **Change in temperature**



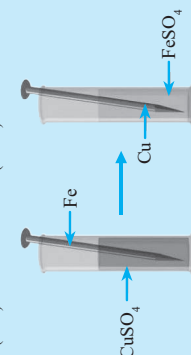
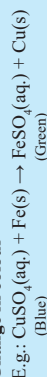
- **Change in state**



- **Formation of precipitate **CBSE 2025****



- **Change in colour**



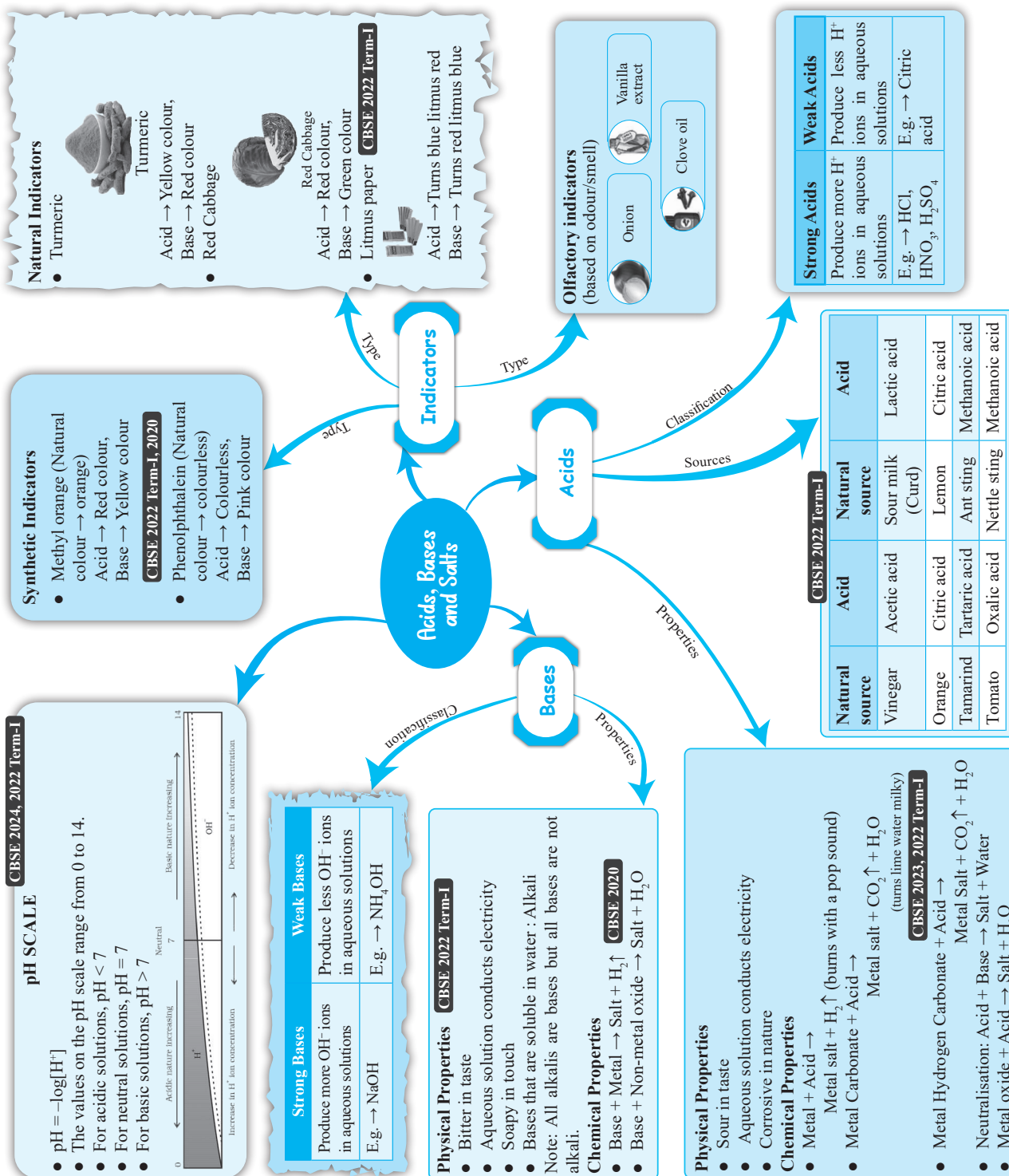
CHAPTER-2

ACIDS, BASES AND SALTS



Cheat Sheet

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To Discover more

Types of salts		
Basic	Acidic	Neutral
- Salts of strong base + weak acid - pH > 7 - E.g: Na_2CO_3, K_3PO_4 etc.	- Salts of strong acid + weak base - pH < 7 - E.g: NH_4Cl, $(\text{NH}_4)_2\text{SO}_4$ etc.	- Salts of strong acid + strong base - pH = 7 - E.g: NaCl, NaNO_3 etc.

CBSE 2025, 2024, 2022 Term-I

Acids,
Bases
and Salts

Salts

Examples

Uses:**Common Salt (NaCl):**

- Important raw material for formation of many compounds.

Caustic Soda (NaOH):

- Used in the manufacturing of soaps and detergents.

Washing Soda ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$): CBSE 2020

- Remove permanent hardness of water.

Baking soda (NaHCO_3): CBSE 2022 Term-I

- Used in the manufacturing of baking powder and as an antacid.

Bleaching powder (CaOCl_2):

- Used as bleaching agent in the textile and paper industries and for disinfecting water.

Plaster of Paris (POP):

- Used as plasters for setting broken and fractured bones; for making moulds.



Cheat Sheet

Common Salt (NaCl) CBSE 2025
 $\text{NaOH (aq)} + \text{HCl (aq)} \rightarrow \text{NaCl (aq)} + \text{H}_2\text{O (l)}$

Caustic Soda (NaOH) CBSE 2025, 2020
 Chlor-Alkali Process:
 $2\text{NaCl (aq)} + 2\text{H}_2\text{O(l)} \xrightarrow{\text{Electrolysis}} 2\text{NaOH (aq)} + \text{Cl}_2 \uparrow + \text{H}_2 \uparrow$
 (Brine) At anode At cathode

Washing Soda ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) CBSE 2025, 2023, 2020
 $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O} \rightarrow \text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

Baking soda (NaHCO_3) CBSE 2025, 2023
 $\text{NaCl} + \text{NH}_3 + \text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{NaHCO}_3 + \text{NH}_4\text{Cl}$
 $2\text{NaHCO}_3 \xrightarrow{\text{heat}} \text{Na}_2\text{CO}_3 + \text{CO}_2 \uparrow + \text{H}_2\text{O}$

Bleaching powder (CaOCl_2) CBSE 2020
 $\text{Ca(OH)}_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$
 (Slaked lime)

Blue vitriol ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) CBSE 2023
 $\text{CuSO}_4 \cdot 5\text{H}_2\text{O} \xrightarrow{\text{heat}} \text{CuSO}_4 + 5\text{H}_2\text{O}$
 (Blue) (White)

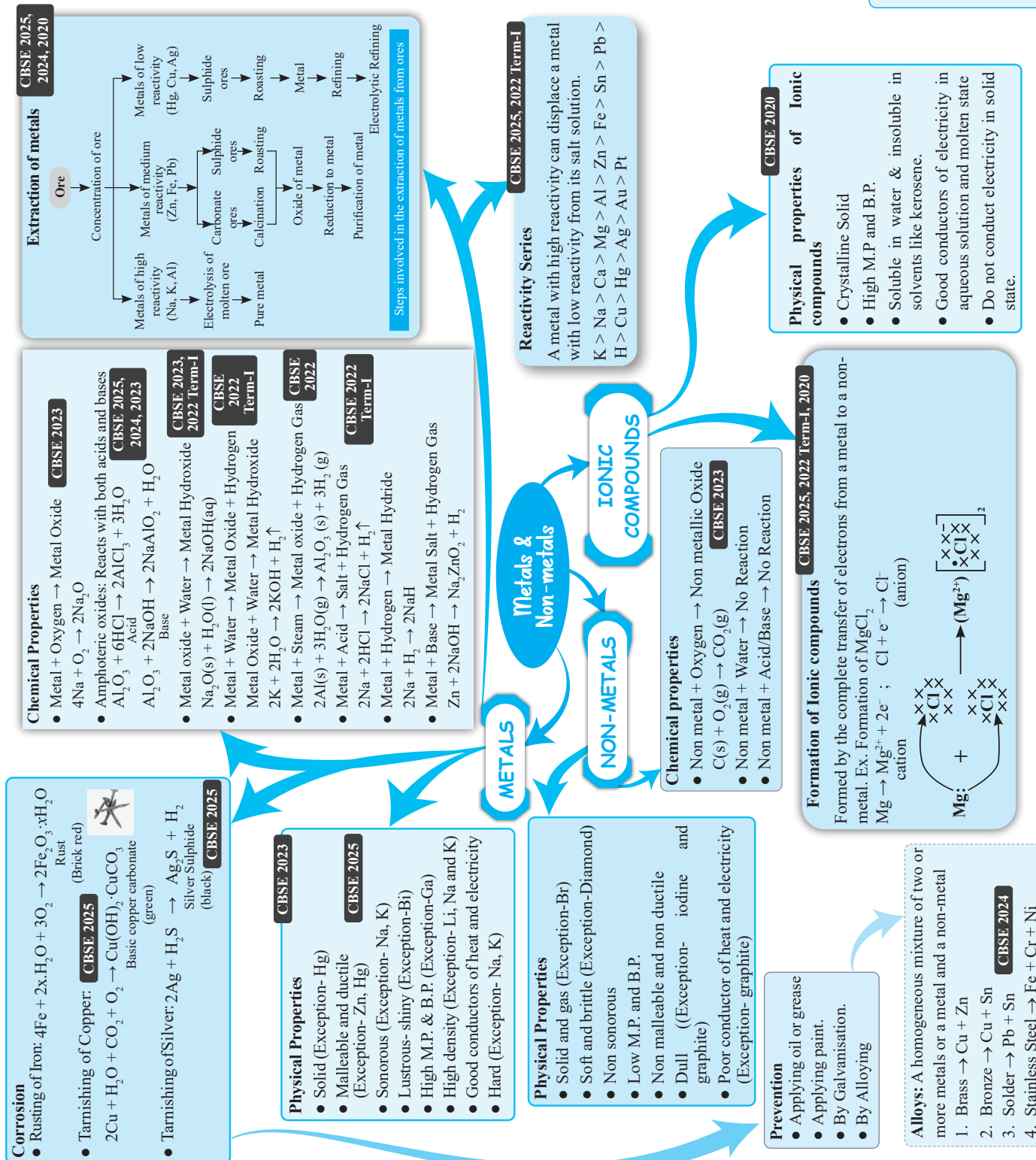
Plaster of Paris (POP) CBSE 2023, 2022 Term-I
 $\text{CaSO}_4 \cdot 2\text{H}_2\text{O} \xrightarrow{\text{heat}/100^\circ\text{C}} \text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O} + \frac{3}{2}\text{H}_2\text{O}$
 (Gypsum) (POP)

CHAPTER-3

METALS AND NON-METALS

Cheat Sheet

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CHAPTER-4

CARBON AND ITS COMPOUNDS

Cheat Sheet

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CBSE 2024, 2022 Term-II 2020

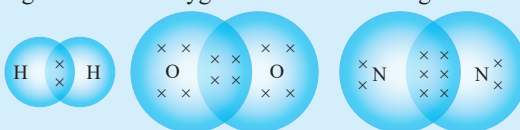
Covalent bond:

Sharing of electrons between atoms.
It can neither form C^{4-} anion nor C^{4+} cation.
It can only share its valence electrons.
Carbon's tetravalency forms diverse compounds.

Electron Dot Structure

CBSE 2024, 2023, 2022 Term-II

Hydrogen: $H-H$ Oxygen: $O=O$ Nitrogen: $N \equiv N$



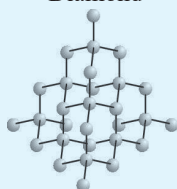
Bonding in Carbon – The Covalent Bond

Allotropes of Carbon

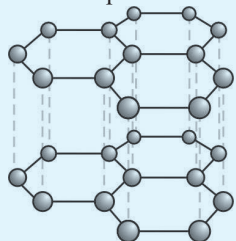
CBSE 2022 Term-II

- Diamond:** Tetrahedral, 3-D arrangement, hardest natural substance.
- Graphite:** Hexagonal layers, smooth and slippery, conducts electricity.
- Fullerene:** atoms arranged in the shape of a football

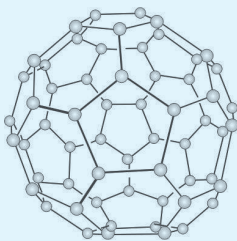
Diamond



Graphite



Fullerene



Carbon and its Compounds

Versatile Nature of Carbon

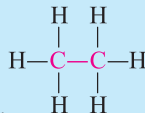
SATURATED AND UNSATURATED CARBON COMPOUNDS

CBSE 2025, 2023, 2022 Term-II

- Saturated (Alkanes):** Single carbon-carbon bonds.

General formula: $C_n H_{2n+2}$.

Example: Ethane (C_2H_6).

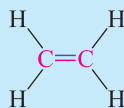


- Unsaturated**

(Alkenes): Double carbon-carbon bonds.

General formula: $C_n H_{2n}$.

Example: Ethene (C_2H_4).

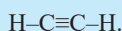


(Alkynes)

Triple carbon-carbon bonds.

General formula: $C_n H_{2n-2}$.

Example: Ethyne (C_2H_2).



Reasons

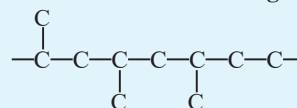
NOMENCLATURE OF CARBON COMPOUNDS

CBSE 2024, 2022 Term-II, 2020

Prefix + Root word + Primary suffix + secondary suffix

Class of compounds	Prefix/Suffix	Example
1. Halo alkane	Prefix- chloro, bromo, etc.	$\begin{array}{c} H & H & H \\ & & \\ H-C & -C & -C-Cl \\ & & \\ H & H & H \end{array}$ Chloropropane $\begin{array}{c} H & H & H \\ & & \\ H-C & -C & -C-Br \\ & & \\ H & H & H \end{array}$ Bromopropane
2. Alcohol	Suffix - ol	$\begin{array}{c} H & H & H \\ & & \\ H-C & -C & -C-OH \\ & & \\ H & H & H \end{array}$ Propanol
3. Aldehyde	Suffix - al	$\begin{array}{c} H & H & H \\ & & \\ H-C & -C & -C=O \\ & & \\ H & H & \end{array}$ Propanal
4. Ketone	Suffix - one	$\begin{array}{c} H & & H \\ & & \\ H-C & -C & -C-H \\ & & \\ H & O & H \end{array}$ Propanone
5. Carboxylic acid	Suffix - oic acid	$\begin{array}{c} H & H & O \\ & & \\ H-C & -C & -C-OH \\ & & \\ H & H & \end{array}$ Propanoic acid
6. Alkenes	Suffix - ene	$\begin{array}{c} H & H & & H \\ & & & \\ H-C & -C & =C & -H \\ & & & \\ H & & & \end{array}$ Propene
7. Alkynes	Suffix - yne	$\begin{array}{c} H \\ \\ H-C & -C \equiv C-H \\ \\ H \end{array}$ Propyne

Catenation: Carbon atoms form long chains.



Tetravalency: Carbon has a **valency of four**, it is capable of bonding with four other atoms of carbon or atoms of some other mono-valent element.

111 MOST PROBABLE QUESTIONS (ANALYZED & SELECTED FROM PYQs)

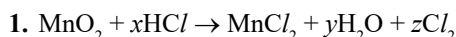
To Access Detailed Explanations

Scan This QR Code



Note: Questions in this section are selected based on repetitive themes and concepts from past examinations, though patterns and typologies may vary.

1. Chemical Reactions and Equations



In order to balance the above chemical equation, the values of x , y and z respectively are: **(1 M) (2024, 2023)**

- (a) 6, 2, 2 (b) 4, 1, 2
(c) 4, 2, 1 (d) 2, 2, 1

2. Which of the following statements about the reaction given below are correct?

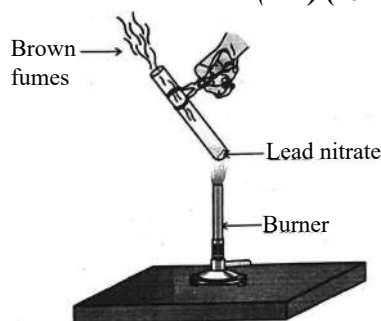


- (i) HCl is oxidized to Cl_2
(ii) MnO_2 is reduced to MnCl_2
(iii) MnCl_2 acts as an oxidizing agent
(iv) HCl acts as an oxidizing agent

(1 M) (2024, 2023, 2022, 2016)

- (a) (ii), (iii) and (iv) (b) (i), (ii) and (iii)
(c) (i) and (ii) only (d) (iii) and (iv) only

3. The emission of brown fumes in the given experimental set-up is due to **(1 M) (2024, 2023, 2022)**



- (a) thermal decomposition of lead nitrate which produces brown fumes of nitrogen dioxide.
(b) thermal decomposition of lead nitrate which produces brown fumes of lead oxide.
(c) oxidation of lead nitrate forming lead oxide and nitrogen dioxide.
(d) oxidation of lead nitrate forming lead oxide and oxygen.

4. **Assertion (A):** Reaction of Quicklime with water is an exothermic reaction.

Reason (R): Quicklime reacts vigorously with water releasing a large amount of heat.

(1 M) (2024, 2023, 2020)

5. While studying the double displacement reaction, the solutions of barium chloride and sodium sulphate are mixed together.

- (i) What do you observe as soon as the two solutions are mixed together?
(ii) What will happen in the above observation made by you after ten minutes?

(2 M) (2022, 2020, 2019, 2016)

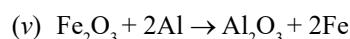
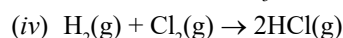
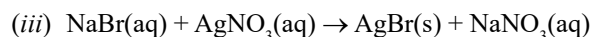
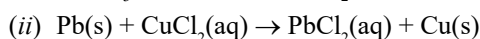
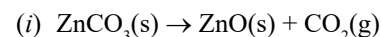
6. (i) While electrolysis of water before passing the current some drops of an acid are added. Why? Name the gases liberated at cathode and anode. Write the relationship between the volume of gas collected at anode and the volume of gas collected at cathode.

- (ii) What is observed when silver chloride is exposed to sunlight? Give the type of reaction involved.

(3 M) (2024, 2023)

7. Decomposition reactions require energy either in the form of heat or light or electricity for breaking down the reactants. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity. **(3 M) (2024, 2020, 2019, 2018)**

8. Select (i) combination reaction, (ii) decomposition reaction and (iii) displacement reaction from the following chemical equations: **(3 M) (2023, 2022, 2019, 2015)**



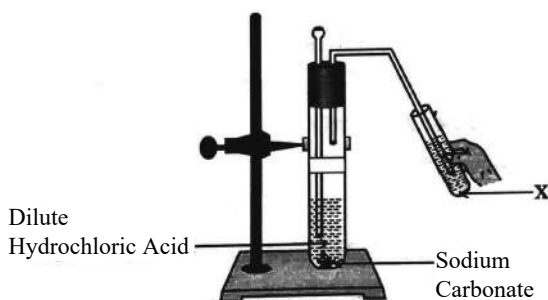
2. Acids, Bases and Salts

9. The table below has information regarding pH and the nature (acidic/basic) of four different solutions. Which one of the options in the table is correct? **(1 M) (2023, 2019)**

Option	Solution	Colour of pH paper	Approximate pH value	Nature of solution
(a)	Lemon juice	Orange	3	Basic
(b)	Milk of magnesia	Blue	10	Basic
(c)	Gastric juice	Red	6	Acidic
(d)	Pure water	Yellow	7	Neutral

10. In the experimental setup given below, it is observed that on passing the gas produced in the reaction in the solution 'X' the solution 'X' first turns milky and then colourless.

(1 M) (2023, 2022, 2019)



The option that justifies the above stated observation is that 'X' is aqueous calcium hydroxide and

- it turns milky due to carbon dioxide gas liberated in the reaction and after sometime it becomes colourless due to formation of calcium carbonate.
- it turns milky due to formation of calcium carbonate and on passing excess of carbon dioxide it becomes colourless due to formation of calcium hydrogen carbonate which is soluble in water.
- it turns milky due to passing of carbon dioxide through it. It turns colourless as on further passing carbon dioxide, sodium hydrogen carbonate is formed which is soluble in water.
- the carbon dioxide liberated during the reaction turns lime water milky due to formation of calcium hydrogen carbonate and after some time it turns colourless due to formation of calcium carbonate which is soluble in water.

11. (a) (i) A compound 'X' which is prepared from gypsum has the property of hardening when mixed with proper quantity of water.

Identify 'X' and write its chemical formula.

- (ii) State the difference in chemical composition between baking soda and baking powder:

(2 M) (2023, 2022, 2020, 2018)

12. During electrolysis of brine, a gas 'G' is liberated at anode. When this gas 'G' is passed through slaked lime, a compound 'C' is formed, which is used for disinfecting drinking water.

- (i) Write formula of 'G' and 'C'.

- (ii) State the chemical equation involved.

- (iii) What is common name of compound 'C'? Give its chemical name. **(3 M) (2023, 2020, 2019, 2016)**

13. (i) Suggest a safe procedure of diluting a strong concentrated acid.

- (ii) Name the salt formed when sulphuric acid is added to sodium hydroxide and write its pH.

- (iii) Dry HCl gas does not change the colour of dry blue litmus paper. Why? **(3 M) (2023, 2019, 2015)**

14. How is washing soda prepared from sodium carbonate? Give its chemical equation. State the type of this salt. Name the type of hardness of water which can be removed by it? **(3 M) (2023, 2020)**

15. Write the chemical composition of tooth enamel. Under what conditions of pH it starts corroding? Explain the reason of tooth decay and suggest one method to prevent it. **(3 M) (2024, 2023)**

16. Design an experimental set-up to demonstrate that "Alcohol and glucose contain hydrogen but are not categorised as acids". Also give the reason to justify this fact.

(3 M) (2025)

17. Salts play a very important role in our daily life. Sodium chloride which is known as common salt is used almost in every kitchen. Baking soda is also a salt used in faster cooking as well as in baking industry. The family of salts is classified on the basis of cations and anions present in them.

(2024, 2023, 2022, 2019)

- (a) Identify the acid and base from which Sodium chloride is formed. **(1 M)**

- (b) Find the cation and the anion present in Calcium sulphate. **(1 M)**

- (c) "Sodium chloride and washing soda both belong to the same family of salts." Justify this statement. **(2 M)**

Or

- (c) Define the term pH scale. Name the salt obtained by the reaction of Potassium hydroxide and Sulphuric acid and give the pH value of its aqueous solution.

(2 M)

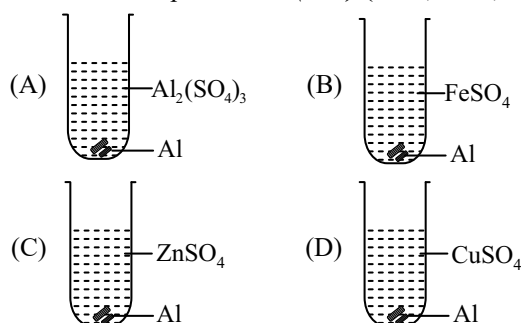
3. Metals and Non-metals

18. The oxide which can react with HCl as well as KOH to give corresponding salt and water is

(1 M) (2024, 2022, 2019)

- (a) CuO (b) Al_2O_3 (c) Na_2O (d) K_2O

19. Mrignayani was doing the experiment of comparing reactivity of metals in the laboratory. She was given aluminium metal and was told to check reactivity by using four solutions as shown below. She would observe that reaction takes place in: (1 M) (2024, 2022, 2019, 2015)



- (a) A and B (b) B, C and D
(c) A, C and D (d) C and D

20. A metal and a non-metal that exists in liquid state at the room temperature are respectively:

(1 M) (2024, 2023, 2016)

- (a) Bromine and Mercury (b) Mercury and Iodine
(c) Mercury and Bromine (d) Iodine and Mercury

21. Silver articles become black when kept in open for some time, whereas copper vessels lose their shiny brown surfaces and gain a green coat when kept in open. Name the substances present in air with which these metals react and write the name of the products formed.

(2 M) (2019, 2016, 2015)

22. Carbon cannot reduce the oxides of sodium, magnesium and aluminum to their respective metals. Why? Where are these metals placed in the reactivity series? How are these metals obtained from their ores? Take an example to explain the process of extraction along with chemical equations.

(5 M) (2020, 2018)

23. The metals produced by various reduction processes are not very pure. They contain impurities, which must be removed to obtain pure metals. The most widely used method for refining impure metals is electrolytic refining.

(2024, 2018)

- (i) What is the cathode and anode made of in the refining of copper by this process? (1 M)
(ii) Name the solution used in the above process and write its formula. (1 M)
(iii) (A) How copper gets refined when electric current is passed in the electrolytic cell? (2 M)

Or

- (iii) (B) You have two beakers 'A' and 'B' containing copper sulphate solution. What would you observe after about 2 hours if you dip a strip of zinc in beaker 'A' and a strip of silver in beaker 'B'?

Give reason for your observations in each case.

(2 M)

24. Almost all metals combine with oxygen to form metal oxides. Metal oxides are generally basic in nature. But some metal oxides show both basic as well as acidic behaviour. Different metals show different reactivities towards oxygen. Some react vigorously while some do not react at all.

(2023, 2022, 2020, 2019)

- (a) What happens when copper is heated in air? (Give the equation of the reaction involved). (1 M)
(b) Why are some metal oxides categorized as amphoteric? Give one example. (1 M)
(c) Complete the following equations: (2 M)
(i) $\text{Na}_2\text{O}_{(s)} + \text{H}_2\text{O}_{(l)} \rightarrow$
(ii) $\text{Al}_2\text{O}_3 + 2\text{NaOH} \rightarrow$

Or

- (c) On burning Sulphur in oxygen a colourless gas is produced. (2 M)
(i) Write chemical equation for the reaction.
(ii) Name the gas formed.
(iii) State the nature of the gas.
(iv) What will be the action of this on a dry litmus paper?

25. The melting points and boiling points of some ionic compounds are given below: (2023, 2022, 2020)

Compound	Melting Point (K)	Boiling Point (K)
NaCl	1074	1686
LiCl	887	1600
CaCl ₂	1045	1900
CaO	2850	3120
MgCl ₂	981	1685

These compounds are termed ionic because they are formed by the transfer of electrons from a metal to a non-metal. The electron transfer in such compounds is controlled by the electronic configuration of the elements involved. Every element tends to attain a completely filled valence shell of its nearest noble gas or a stable octet.

- (i) Show the electron transfer in the formation of magnesium chloride. **(1 M)**
- (ii) List two properties of ionic compounds other than their high melting and boiling points. **(1 M)**
- (iii) (A) While forming an ionic compound, say sodium chloride, how does sodium atom attain its stable configuration? **(2 M)**

Or

- (B) Give reasons: **(2 M)**
 - (i) Why do ionic compounds in the solid state not conduct electricity?
 - (ii) What happens at the cathode when electricity is passed through an aqueous solution of sodium chloride?

26. (i) Consider the following metals:

K, Ca, Al, Cu, Ag, Fe

Select from the above metals, a metal which

- I. does not react with oxygen even at high temperature.
- II. reacts with oxygen at ordinary temperature and forms a protective oxide layer which prevents the metal from further oxidation.
- III. catches fire when kept in the open.
- IV. does not burn in oxygen but the hot metal is coated with a black coloured oxide layer.

- (ii) What are amphoteric oxides? With the help of balanced chemical equations show that aluminium oxide is an amphoteric oxide.
 - (iii) What are alkalis? Give one example. **(5 M) (2025)**
27. (i) With the help of balanced chemical equations state the process of extracting (I) mercury from its ore called cinnabar. and (II) copper from its sulphide ore.

- (ii) Silver and copper articles slowly lose their shiny surfaces when exposed to air. Name the compounds formed on (I) silver articles, and (II) copper articles in the form of coating. **(5 M) (2025)**

4. Carbon and its Compounds

28. A student took four test tubes P, Q, R and S and filled about 8 mL of distilled water in each. After that he dissolved an equal amount of Na₂SO₄ in P, K₂SO₄ in Q, CaSO₄ in R and MgSO₄ in S. On adding an equal amount of soap solution and shaking each test tube well, a good amount of lather will be obtained in the test tubes:

(1 M) (2019, 2017, 2016, 2015)

- (a) P and Q
- (b) P and R
- (c) P, Q and S
- (d) Q, R and S

29. A gas is liberated immediately with a brisk effervescence, when you add acetic acid to sodium hydrogen carbonate powder in a test tube. Name the gas and describe the test that confirms the identity of the gas.

(2 M) (2019, 2017, 2016, 2015)

30. (a) Why are most carbon compounds poor conductors of electricity?

- (b) Write the name and structure of a saturated compound in which the carbon atoms are arranged in a ring. Give the number of single bonds present in this compound.

(3 M) (2024, 2019, 2018)

31. (a) Draw the electron dot structure for ethyne.

- (b) List two differences between the properties exhibited by covalent compounds and ionic compounds.

(3 M) (2023, 2022, 2019, 2015)

32. Distinguish between esterification and saponification reactions with the help of the chemical equations for each. State one use of each (i) esters, and (ii) saponification process.

(3 M) (2023, 2017, 2016)

33. (a) A saturated organic compound 'A' belongs to the homologous series of alcohols.

On heating 'A' with concentrated sulphuric acid at 443 K. it forms an unsaturated compound 'B' with molecular mass 28u.

The compound B on addition of one mole of hydrogen in the presence of Nickel, changes to a saturated hydrocarbon 'C'.

- (i) Identify A, B and C.

- (ii) Write the chemical equations showing the conversion of A into B.

- (iii) What happens when compound *C* undergoes combustion?
- (iv) State one industrial application of hydrogenation reaction.
- (v) Name the products formed when compound *A* reacts with sodium.

(5 M) (2023, 2020, 2019, 2018, 2016)

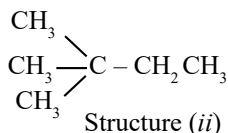
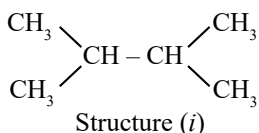
34. (a) (i) Give reason why carbon can neither form C^{4+} cations nor C^{4-} anions but form covalent compounds.
- (ii) What is homologous series of carbon compound? Write the molecular formula of any two consecutive members of homologous series of aldehydes.
- (iii) Draw the structure of the molecule of cyclohexane (C_6H_{12}). (5 M) (2024, 2022, 2020)

35. (i) Draw the structure of the following compounds:

(a) Butanoic acid

(b) Chloropentane

- (ii) How are structure (i) and structure (ii) given below related to one another? Give reason to justify your answer.



Draw one more possible structure for above case.

- (iii) Differentiate between saturated and unsaturated carbon compounds on the basis of their general formula.

(5 M) (2023, 2016)

36. Soaps and detergents are both types of salts. State the difference between the two. Write the mechanism of the cleansing action of soaps. Why do soaps not form lather (foam) with hard water? Mention any two problems that arise due to the use of detergents instead of soaps.

(5 M) (2023, 2020, 2017, 2015)

37. 'A' and 'B' are two salts used for washing purposes. Salt 'A' is used for bathing also. Four test tubes I, II, III and IV as mentioned below are taken.

- I. Rain water + solution of salt 'A'
- II. Rain water + solution of salt 'B'
- III. Tubewell water + solution of salt 'A'
- IV. Tubewell water + solution of salt 'B'

The test tubes are shaken one by one almost identically for the same time and the lengths of foam formed in each test tube is noted. (2 M) (2025, 2020, 2019, 2017, 2016, 2015)

- (i) In which one of the four test tubes is the foam formed the minimum? (1 M)
- (ii) Differentiate between salt A and salt B. (1 M)
- (iii)(A) What are esters? What happens when an ester reacts with an alkali (say sodium hydroxide)? Give chemical equation for the reaction. (2 M)

Or

- (iii)(B) What is the cause of hardness of water? Sometimes it is observed that while bathing foam is formed with difficulty and an insoluble substance is formed. Name this substance and write the cause of its formation.

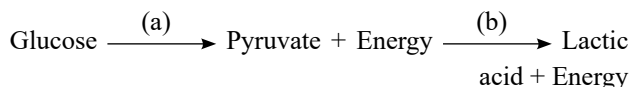
5. Life Processes

38. Opening and closing of stomata is due to:

(1 M) (2025, 2024, 2023, 2022, 2020)

- (a) High pressure of gases inside the cells.
- (b) Movement of water in and out of the guard cells.
- (c) Stimulus of light in the guard cells.
- (d) Diffusion of CO_2 in and out of the guard cells.

39. The breakdown of glucose has taken the following pathway:



The sites 'a' and 'b' respectively are: (1 M) (2025)

- (a) Mitochondria and Oxygen deficient muscle cells
- (b) Cytoplasm and Oxygen rich muscle cells
- (c) Cytoplasm and Yeast cells
- (d) Cytoplasm and Oxygen deficient muscle cells

40. (a) State the role played by the following in the process of digestion.

- (i) Enzyme trypsin
- (ii) Enzyme lipase

- (b) List two functions of finger-like projections present in the small intestine. (3 M) (2024, 2020)

41. (i) Why is respiratory pigment needed in multicellular organisms with large body size? (1 M)

- (ii) Give reasons for the following: (2 M) (2025, 2024)

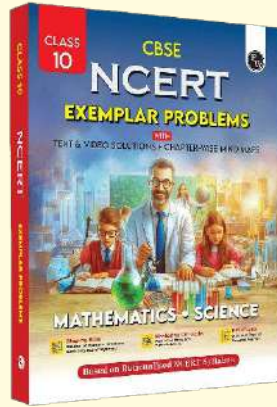
- (a) Rings of cartilage are present in the throat.
- (b) Lungs always contain a residual volume of air.
- (c) The diaphragm flattens and ribs are lifted up when we breathe in.
- (d) Walls of alveoli contain an extensive network of blood vessels.

The Must-Have Books for Conquering **Board Exams**



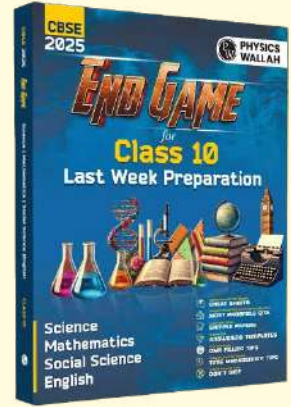
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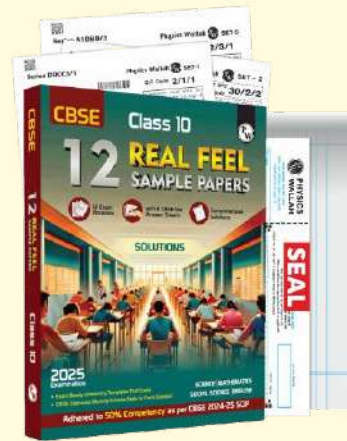
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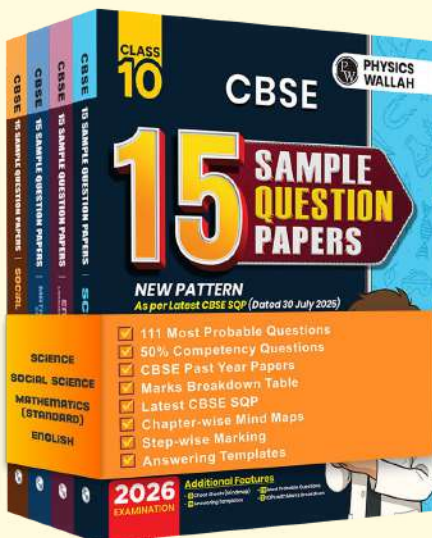
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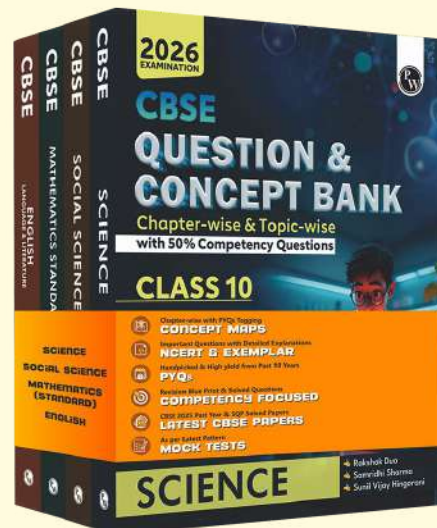
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CBSE SAMPLE QUESTION PAPER

(Issued by CBSE on 30th July, 2025)

Class-X Session: 2025-26

SCIENCE (086)

Time allowed : 3 hours

Maximum Marks : 80

GENERAL INSTRUCTIONS:

- (i) This question paper consists of 39 questions in 3 sections. **Section A** is **Biology**, **Section B** is **Chemistry** and **Section C** is **Physics**.
- (ii) All questions are **compulsory**. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
-

SECTION - A

1. Select the group in which all organisms have the same mode of nutrition.

- (a) *Cuscuta*, yeast, legumes, leeches and tapeworm
- (b) Cactus, ticks, lice, leeches and cow
- (c) *Cuscuta*, ticks, lice, leeches and tapeworm
- (d) Cactus, grass, lice, lion and tapeworm

Sol. (c) *Cuscuta*, ticks, lice, leeches and tapeworm; as all of these are parasites.

(1 M)

2. Which of the following options indicates the products formed after breakdown of the glucose in our muscle cells when there is lack of oxygen?

- (a) Ethanol + carbon dioxide + Energy
- (b) Lactic acid + Energy
- (c) Lactic acid + carbon monoxide + Energy
- (d) Carbon dioxide + Water + Energy

Sol. (b) Lactic acid + Energy

(1 M)

3. Which of the following is a correct combination of function and part of the brain?

- (a) Posture and balance: Cerebrum
- (b) Salivation: Medulla in midbrain
- (c) Hunger: Pons in hindbrain
- (d) Blood pressure: Medulla in hindbrain

Sol. (d) Blood pressure: Medulla in hindbrain

(1 M)

4. The blood glucose level in a patient was very high. It may be due to inadequate secretion of:

- (a) growth hormone from pituitary gland
- (b) oestrogen from ovary
- (c) insulin from pituitary gland
- (d) insulin from pancreas

Sol. (d) insulin from pancreas

(1 M)

5. In a cross between black furred rabbit (B) and white furred rabbit (b), all offspring were found to have black fur. What can be inferred about the genetic makeup of the parent rabbits?

(a) $BB \times bb$ (b) $Bb \times Bb$ (c) $Bb \times bb$ (d) $bb \times bb$

Sol. (a) $BB \times bb$

(1 M)

6. Which are the correct statements related to ozone?

- (i) Ozone layer helps in increasing the UV radiations reaching earth.
(ii) Ozone is a deadly poison.
(iii) Ozone layer shields the earth from UV radiations.
(iv) Ozone layer prevents UV rays which cause skin cancer.
(v) Ozone is formed with the help of Chlorofluorocarbons.

(a) (i), (ii), (iii) (b) (ii), (iii), (iv) (c) (iii), (iv), (v) (d) (i), (iv), (v)

Sol. (b) (ii), (iii), (iv)

(1 M)

7. Which of the following human activities has resulted in an increase of non-biodegradable substances?

- (a) Organic farming
(b) Increase in tree plantation
(c) Use of plastic as packaging material
(d) Composting of kitchen waste

Sol. (c) Use of plastic as packaging material.

(1 M)

The following two questions consist of two statements – **Assertion (A)** and **Reason (R)**. Answer these questions by selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

8. **Assertion (A):** Tallness of a pea plant is controlled by an enzyme.

Reason (R): The gene for that enzyme makes proteins which help the plant to be tall.

Sol. (a) Both A and R are true, and R is the correct explanation of A.

(1 M)

9. **Assertion (A):** Vulture will always have the least amount of pesticides in a food chain.

Reason (R): Vulture occupies the last trophic level and it gets only 10% of energy of the previous trophic level.

Sol. (d) A is false but R is true

(1 M)

10. Unlike animals, plants do not have any excretory products as they do not eat food. Comment upon the statement with justification.

Sol. It is completely wrong to say that plants do not produce any excretory products.

However, plants use completely different strategies for excretion than those of the animals. They get rid of these wastes in different manner (any two):

- (i) Oxygen, a photosynthetic waste, is removed through stomata.
(ii) Excess water is removed by transpiration through stomata.
(iii) Other metabolic wastes are either stored in dead cells, resins and gums or are removed through falling of old leaves.
(iv) Many waste products are stored in cellular vacuoles.

(2 M)

11. Students to attempt either option (A) or (B).

(A) How many chambers are there in the heart of the following organisms? How is mixing of oxygenated and deoxygenated blood prevented in their body?

- (i) Fishes
(ii) Humans

OR

(B) Explain the mechanism by which the water is transported in plants?

Sol. Students to attempt either option (A) or (B).

(A) (i) There are two chambers in the heart of fish. The blood is pumped to the gills, is oxygenated there and passes directly to the rest of the body.

(ii) There are four chambers in the heart of a human being. Separation of the right side and the left side of the heart by septum prevents mixing of oxygenated and de-oxygenated blood. (2 M)

OR

(B) Xylem moves water and minerals obtained from the soil through roots to all other parts of the plant in a unidirectional manner// Transpiration takes place from leaf which causes a transpirational pull in the tracheids and vessels of xylem facilitating upward movement of water// roots actively uptake ions from the soil, leading to difference in concentration gradient, thereby water moves into the roots to eliminate this difference/ creating a steady movement of water into root xylem. (2 M)

12. About 100 acres of forest land was declared as Natural reserve park. The following organisms were predominant in the Natural reserve park:

rabbit, frog, grass, fish, fox, water insects, zebra, peacock, snake, trees, bird, owl, insects, tiger, vulture, duck.

Create a food web comprising two separate food chains with different producers by using the above data.

Sol. Tree food chain- tree, zebra, tiger /Any other food chain

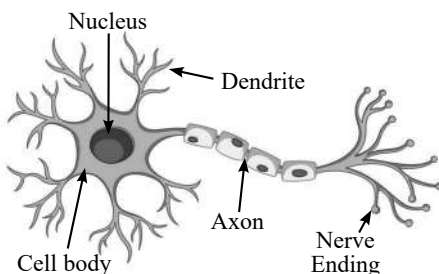
Grassland food chain- grass, zebra, tiger / Any other food chain

Food web- Join the two food chains at a common point (zebra). (2 M)

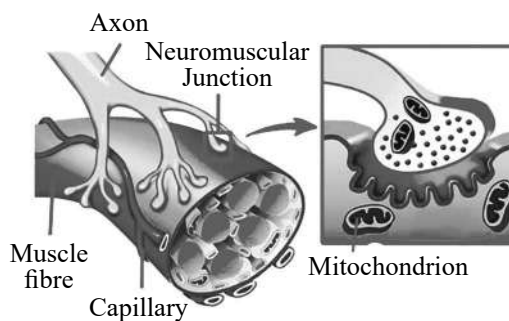
13. Draw and explain how the nerve cells help in transmission of impulses?

Sol.

- All information from our environment is detected by the specialised tips of some nerve cells. The information acquired at the end of the dendritic tip of a nerve cell (Fig. a), sets off a chemical reaction that creates an electrical impulse.
- This impulse travels from the dendrite to the cell body, and then along the axon to its end. At the end of the axon, the electrical impulse sets off the release of some chemicals.
- These chemicals cross the gap, or synapse, and start a similar electrical impulse in a dendrite of the next neuron. This is how nervous impulses travel in the body. (Fig b).



(a) Structure of neuron



(b) Neuromuscular Junction

(3 M)

14. In a genetic experiment, plants with pure round green seeds (RRyy) were crossed with plants with wrinkled yellow seeds (rrYY).

(i) Show the gametes formed when F_1 was self-pollinated.

(ii) A total of 144 seeds were produced which developed into saplings. Show the ratio in which these traits are independently inherited in these 144 sapling.

Sol. (i) RY, Ry, rY, ry

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To Discover more

(ii) The traits which are independently inherited are as follows

Tall round: 81

Tall wrinkled: 27

Short round: 27

Short wrinkled: 9

(Ratio :- 9 : 3 : 3 : 1)

(3 M)

- 15.** Neha consumed boiled sweet potatoes and boiled eggs for breakfast. Help her to understand some steps in the process of digestion of the food taken by her by answering the questions given below.

Attempt either subpart (a) or (b).

- (a) Which of these food items is rich in proteins? In which part of the alimentary canal is the digestion of this component initiated? Name the enzymes, conditions required and the glands associated with the digestion here.

OR

- (b) Which of these food items contains fats? How is it digested?
(c) Which of these food items is rich in starch? How is its digestion initiated?
(d) The figure given below represents parts of the human alimentary canal. Which of these parts will have the maximum amount of digested food as soon as the process of digestion is completed?

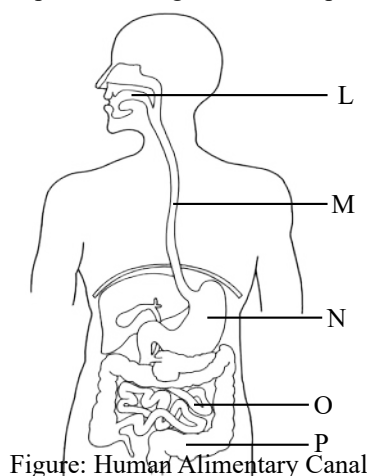


Figure: Human Alimentary Canal

Sol. Students to attempt either subpart (a) or (b).

- (a) Eggs are rich in proteins. The digestion of proteins is initiated in the stomach. Gastric glands present in the wall of the stomach release hydrochloric acid, a protein digesting enzyme called pepsin and mucus. The hydrochloric acid creates an acidic medium which facilitates the action of enzyme pepsin.

OR

- (b) Eggs contain fats. Bile juice from the liver breaks down large fat globules into smaller ones for increasing the efficiency of the enzymes and making the medium alkaline. Emulsified fats are digested by lipase secreted by pancreas.
(c) Sweet potatoes are rich in starch. The saliva secreted by salivary glands present in buccal cavity contain an enzyme called salivary amylase that breaks down starch which is a complex molecule to give sugar.
(d) Small Intestine will have a maximum amount of digested food as the process of digestion is completed in the small intestine.

(4 M)

16. Attempt either option (A) or (B).

(A) Puneet wanted to grow banana plants.

- (i) Based on your knowledge on plant reproduction should he opt for seeds or any alternate method of reproduction. Justify your answer.
- (ii) Offsprings of a banana plant usually show very little variation. What causes variation and are variations good or bad? Justify.

OR

(B) Annie was conducting research on the number of fruits produced by watermelon under different conditions. She grew 25 watermelon plants each in both glass house A and B. She introduced pollinators in glass house A only.

- (i) What difference will she observe in the number of fruits produced in the two glass houses? Explain with reason.
- (ii) List 3 changes that will occur in a flower once it gets fertilized.

Sol. Students to attempt either option (A) or (B).

- (A) (i) Puneet should not choose seeds as banana plants have lost the capacity to produce seeds. He should go for vegetative propagation of banana (by stem cutting).
- (ii) Errors and variations in DNA copying cause variation.

Variation is good as it can help a population tide over unfavourable conditions by survival of some variants.

It is bad as parents' desirable characters are lost/ sometimes variants are not able to survive in the new conditions/ the variant is not able to use the cellular apparatus efficiently. (5 M)

OR

- (B) (i) Watermelon has unisexual flowers, the male and female flowers are separate.

The presence of pollinators will facilitate cross pollination between the flowers increasing the chance of fertilization and number of fruits being produced. Without pollinators the probability of pollen falling on stigma reduces in a unisexual flower, especially if they are far apart thus the number of fruits produced will be less.

- (ii) The three changes observed are:

- Ovule develops a tough coat and becomes seed.
- Ovary grows and ripens to form fruit.
- Petals, sepals, stamen, style and stigma may shrivel and fall off.

(5 M)

SECTION - B

17. Which of the following equations represent redox reactions and what are the values for 'p' and 'q' in these equations?

Equation 1: $\text{Fe}_2\text{O}_3(\text{s}) + 2\text{Al}(\text{s}) \longrightarrow \text{Al}_2\text{O}_3(\text{s}) + p\text{Fe}(\text{l}) + \text{heat}$

Equation 2: $2\text{C}_4\text{H}_{10}(\text{g}) + 13\text{O}_2(\text{g}) \xrightarrow{\Delta} 8\text{CO}_2(\text{g}) + q\text{H}_2\text{O}(\text{g})$

- (a) Only equation 1 is a redox reaction, p=1 and q=3
- (b) Both equations 1 and 2 are redox reactions, p= 2 and q=4
- (c) Only equation 2 is a redox reaction, p= 2 and q= 10
- (d) Both equations 1 and 2 are redox reactions, p= 2 and q=10

Sol. (d) Both equations 1 and 2 are redox reactions, p= 2 and q=10

(1 M)

18. Four statements about the reactions of oxides with dilute hydrochloric acid and aqueous sodium hydroxide are listed.

- (i) Aluminium oxide reacts with both dilute hydrochloric acid and aqueous sodium hydroxide.
- (ii) Calcium oxide reacts with dilute hydrochloric acid and aqueous sodium hydroxide.
- (iii) Zinc oxide reacts with both dilute hydrochloric acid and aqueous sodium hydroxide.
- (iv) Sulphur dioxide does not react with either dilute hydrochloric acid or aqueous sodium hydroxide.

Which statements are correct?

- (a) (i) and (ii)
- (b) (i) and (iii)
- (c) (ii) and (iv)
- (d) (iii) and (iv)

Sol. (b) (i) and (iii)

(1 M)

19. An iron nail is added to each of the two test tubes 'P' and 'Q' containing aqueous copper (II) sulphate, and aqueous silver nitrate respectively. Which of the following observation is correct?

- (a) In test tube 'P' iron nail is coated with a blue coating and in test tube 'Q' there is no reaction.
- (b) Iron nail is coated with a brown coating in test tube 'P' and silver coating in test tube 'Q'.
- (c) There is no reaction in either of the test tubes 'P' or 'Q'.
- (d) There is no reaction in test tube 'P' but a silver coating on iron nail is seen in test tube 'Q'.

Sol. (b) Iron nail is coated with a brown coating in test tube 'P' and silver coating in test tube 'Q'. (1 M)

20. Methyl orange is added to dilute hydrochloric acid and to aqueous sodium hydroxide. What is the colour of the methyl orange in each solution?

Sample	Colour in dilute hydrochloric acid	Colour in aqueous sodium hydroxide
(a)	Orange	Red
(b)	Red	Yellow
(c)	Red	Orange
(d)	Yellow	Red

Sol. (b) Red Yellow (1 M)

21. Which of the following substances when dissolved in equal volume of water, will have the highest pH value?

- (a) Sulphuric acid
- (b) Acetic acid
- (c) Magnesium hydroxide
- (d) Sodium hydroxide

Sol. (d) Sodium hydroxide (1 M)

22. When excess of carbon dioxide is passed through lime water, the milkiness disappears because

- (a) water soluble calcium carbonate converts to water soluble calcium bicarbonate.
- (b) insoluble calcium carbonate converts to water soluble calcium bicarbonate.
- (c) water soluble calcium carbonate converts to insoluble calcium bicarbonate.
- (d) insoluble calcium carbonate converts to insoluble calcium bicarbonate.

Sol. (b) insoluble calcium carbonate converts to water soluble calcium bicarbonate. (1 M)

23. In the reaction of aqueous solution of barium chloride with aqueous solution of sodium sulphate, the aqueous solution formed will be:

- (a) BaCl_2
- (b) BaSO_4
- (c) Na_2SO_4
- (d) NaCl

Sol. (d) NaCl (1 M)

The following question consists of two statements – **Assertion (A)** and **Reason (R)**. Answer these questions by selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

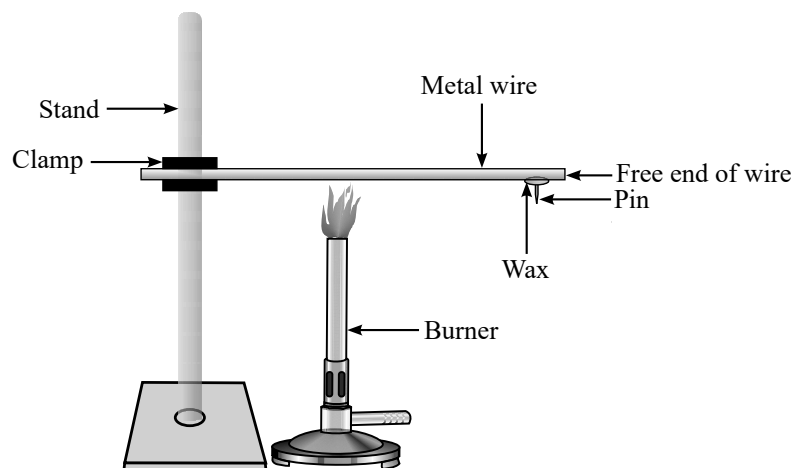
24. **Assertion (A):** C_4H_8 , C_4H_6 and C_4H_{10} are members of the same homologous series

Reason (R): C_4H_8 , C_4H_6 , C_3H_4 , C_3H_6 , C_2H_4 , C_2H_2 are unsaturated hydrocarbons.

Sol. (d) A is false but R is true (1 M)

25. The following activity is set-up in the science lab by the teacher.

He clamped an aluminium wire on a stand and fixed a pin to the free end of the wire using wax. Then he heated the wire with a burner from the end where the wire is clamped. Students observed the pin fall off.



- (a) If the teacher replaces aluminium wire by silver wire, will the students' observation change? Justify your answer.
 (b) Will the aluminium wire melt? Give reason for your answer.

Sol. (a) The pin will drop but will take less time to drop because silver is a better conductor of heat than aluminium.

(b) No, aluminium wire will not melt because metals have high melting points.

(2 M)

26. Attempt either option (A) or (B).

(A) An element 'X' is stored in kerosene, and cannot be extracted from its ore using a reducing agent. 'X' forms an ionic compound on reaction with chlorine.

(i) Can we store 'X' in water? Give reason to support your answer.

(ii) Identify element 'X'. Name the process used and write the equation for extraction of 'X' from its ore.

OR

(B) The domes of many building in Europe are made of copper. These domes now appear greenish in colour.

(i) Why do the domes appear greenish though copper is orange-red in colour?

(ii) In your opinion, should the copper domes be replaced by iron domes to overcome the problem of change of colour of copper domes?

(iii) Domes used to be made from thin sheets of metals. Why did the ancient architects use copper to make domes?

Sol. Attempt either option (A) or (B).

(A) (i) No, 'X' is highly reactive and will catch fire.

(ii) Sodium.

It is extracted from molten sodium chloride by electrolytic reduction

Cathode: $\text{Na}^+ + \text{e}^- \longrightarrow \text{Na}$

Anode: $2\text{Cl}^- \longrightarrow \text{Cl}_2 + 2\text{e}^-$

(Potassium is also a correct option)

(3 M)

OR

(B) (i) Copper gets oxidised/corroded to basic copper carbonate which is greenish in colour.

(ii) No, iron will rust and the reddish layer of rust will come off exposing iron to air, the dome will not be stable. Copper on the other hand on corrosion forms a protective layer which does not allow further corrosion.

(iii) Copper is a highly malleable metal, its thin sheets can be used to give different shapes of roofs, like the shape of a dome.

(3 M)

27. Amrita electrolysed distilled water using the set-up shown in figure 1. She was expecting two gases to be evolved at the anode and cathode respectively

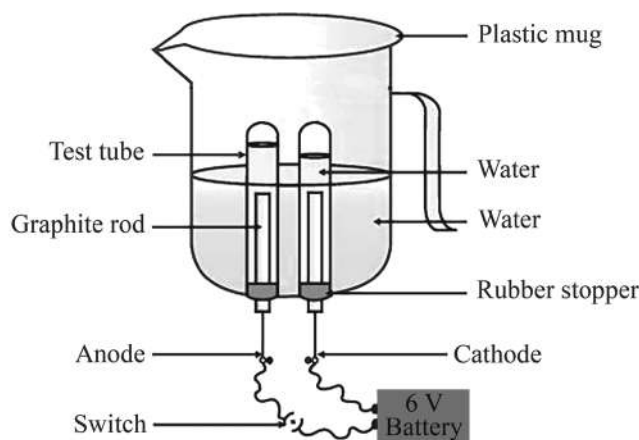


Fig. 1

Suddenly, she realised that the bulb in the circuit did not glow when she used distilled water (figure 2)

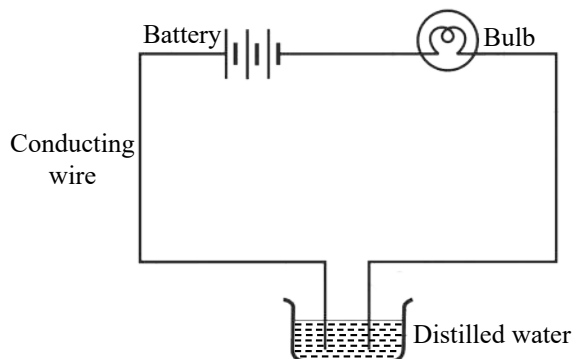


Fig. 2

After this realization, she added a substance to the distilled water for electrolysis to take place.

Answer the following questions based on the information given above:

- Which gas was she expecting to be formed at the anode and which one at the cathode respectively?
- Why did the bulb not glow when Amrita passed electricity through distilled water?
- Which substance was added by Amrita to distilled water to get the expected result?

Sol. (a) She was expecting Oxygen gas to be formed at the anode and hydrogen at the cathode.

(b) Distilled water is a poor conductor of electricity.

(c) Adding few drops of H_2SO_4 or some NaCl (or any other strong electrolyte).

(3 M)

28. Sara took 2 mL of dilute NaOH solution in a test tube and added two drops of phenolphthalein solution to it. The solution turned pink in colour. She added dilute H_2SO_4 to the above solution drop by drop until the solution in the test tube became colourless. 40 drops of dilute H_2SO_4 were used for the change in colour from pink to colourless. When Sara added a drop of NaOH to the solution, the colour changed to back to pink again.

Sara now tried the activity with different volumes of NaOH and recorded her observation in the table given below:

S. No.	Volume of dil. NaOH taken (mL)	Drops of dil. H_2SO_4 used
1	2	20
2	3	30
3	4	40

Answer the following questions based on the above information:

- (a) If Sara used concentrated H_2SO_4 in place of dilute H_2SO_4 , how many drops will be required for the change in colour to be observed?
- 40
 - < 40
 - > 40

Justify your answer.

- (b) Sara measured 20 drops of dil. H_2SO_4 and found its volume to be 1 mL. If Sara observed a change in colour of NaOH solution by using 3 mL of H_2SO_4 , how many mL of NaOH did she add to the test tube initially?

OR

Sara takes 10 drops of dilute H_2SO_4 in the test tube and adds two drops of phenolphthalein solution to it. Then she adds NaOH dropwise. Sara observes a change in colour after adding 20 drops of NaOH. What change in colour would she observe and why?

- (c) Write a balanced chemical equation for the reaction taking place in the above experiment. Which of the following is true and why? The reaction is a
- neutralisation and double displacement reaction
 - neutralisation and precipitation reaction
 - precipitation and double displacement reaction
 - neutralisation, double displacement as well as precipitation reaction.

Sol. (a) (ii) < 40, because concentrated H_2SO_4 gives more H^+ ions than dilute acid.

- (b) 3 mL of H_2SO_4 will be 60 drops, which will neutralise 6 mL of NaOH

S. No.	Volume of dil. NaOH taken (mL)	Drops of dil. H_2SO_4 used
1	2	20 (1 mL)
2	3	30 (1.5 mL)
3	4	40 (2 mL)
4	6	3 mL = 60 drops

OR

Colour will change from colourless to pink. Phenolphthalein is colourless in acids and turns pink in basic solution.

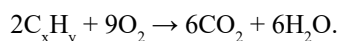
- (c) $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$

- (i) neutralisation and double displacement reaction.

Base NaOH is getting neutralised and forming salt + water. It is double displacement as Na^+ ions are being replaced by H^+ and OH^- by SO_4^{2-} . It is not precipitation reaction because Na_2SO_4 is soluble in water. **(4 M)**

29. Attempt either option (A) or (B).

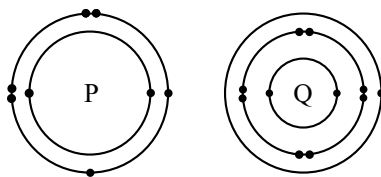
- (A) A hydrocarbon with the formula C_xH_y undergoes complete combustion as shown in the following equation:



- What are the values of 'x' and 'y'?
- Give the chemical (IUPAC) name of the hydrocarbon.
- Draw its electron dot structure.
- Name the alcohol which on heating with conc. H_2SO_4 will produce the above hydrocarbon C_xH_y .
- Write a balanced chemical equation for the reaction of C_xH_y with hydrogen gas in presence of Nickel.

OR

(B) The electronic structures of atoms P and Q are shown below



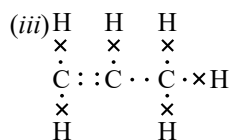
Based on the information given above, answer the following questions:

- If P and Q combine to form a compound, what type of bond is formed between them?
- Give the chemical formula of the compound formed.
- The compound so formed is dissolved in water. Is the resultant solution acidic or basic in nature? Justify your answer.
- Write the chemical equation for the reaction between 'Q' and ethanol.
- What will be the formula of the compound formed when 'P' undergoes bonding with carbon?

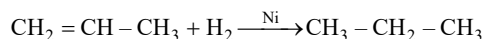
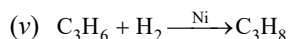
Sol. Students to attempt either option (A) or (B).

(A) (i) $x = 3$, $y = 6$

(ii) Propene



(iv) Propanol



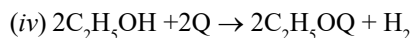
(5 M)

OR

(B) (i) Ionic bond

(ii) Q_2P

(iii) Basic, metallic oxides are basic in nature.



(v) CP_2

(5 M)

SECTION - C

30. Arnab was making notes and he wrote down the following statements from his understanding of reflection from curved surfaces.

- Concave mirrors can produce both real and virtual images depending on the position of the object.
- Convex mirrors always produce real, inverted images regardless of the object's position.
- In both concave and convex mirrors, the image location can be determined using the mirror formula $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ where f is the focal length, v is the image distance, and u is the object distance.

Choose from the following the correct option that lists the correct statements about reflection from curved surfaces.

- (a) i and ii B. i, ii and iii C. ii and iii D. i and iii

Sol. (d) Statement (ii) is incorrect because convex mirrors always form virtual, erect, and diminished images, not real and inverted ones.

Statements (i) and (iii) are correct.

(1 M)

31. Choose the correct option from the below which explains the reason for us to perceive the day sky as blue.
- As sunlight passes through the atmosphere, shorter wavelengths, such as blue are scattered more than other colors.
 - The sky appears blue because all colors are scattered equally, but blue light is stronger and more visible to the human eye.
 - The blue color of the sky is due to longer wavelengths like red and orange scattering more than shorter wavelengths, making blue stand out more.
 - The atmosphere contains blue-colored particles that give the sky its blue appearance.

Sol. (a) As sunlight passes through the atmosphere, Rayleigh scattering causes shorter wavelengths, such as blue and violet, to scatter more than other colors, but our eyes are more sensitive to blue than violet. **(1 M)**

The following question consists of two statements – **Assertion (A)** and **Reason (R)**. Answer these questions by selecting the appropriate option given below:

- Both A and R are true, and R is the correct explanation of A.
- Both A and R are true, and R is not the correct explanation of A.
- A is true but R is false.
- A is false but R is true.

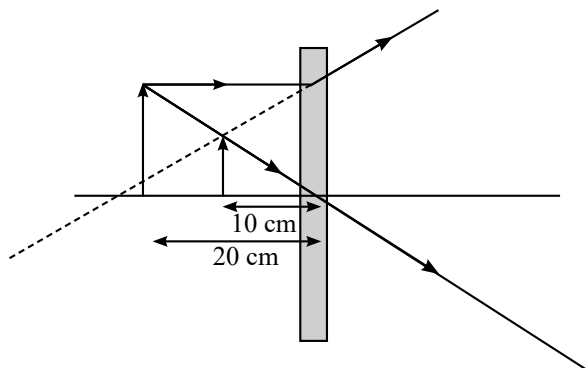
32. **Assertion (A):** A point object is placed at a distance of 26 cm from a convex mirror of focal length 26 cm. The image will not form at infinity.

Reason (R): For above given system the equation $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ gives $v = \infty$.

Sol. (c) Assertion (A) is true because a convex mirror always forms a virtual, erect, and diminished image, not at infinity, regardless of object distance.

Reason (R) is false because a convex mirror, focal length and object distance are both negative, and the mirror formula does not give $v = \infty$. **(2 M)**

33.



The above image shows the formation of an image with an optical instrument.

- Identify the optical instrument (shown schematically as a rectangle) in the image.
- What type of image is formed in this case?
- Based on the measurements given in the image, calculate the focal length of the instrument.

Sol. (i) The optical instrument shown in the figure is a concave lens.

(ii) The image formed is a virtual image.

(iii) To find the focal length for of a concave lens, we can use the lens formula:

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

where:

- $u = -20$ cm (object distance, taken as negative for concave lenses),
- $v = -10$ cm (image distance, also taken as negative since the image formed by a concave lens is virtual).

Solution:

1. Substitute the values into the lens formula:

$$\frac{1}{f} = \frac{1}{-10} - \frac{1}{-20}$$

2. Simplify the terms:

$$\frac{1}{f} = \frac{1}{-10} - \frac{1}{-20}$$

3. Find a common denominator:

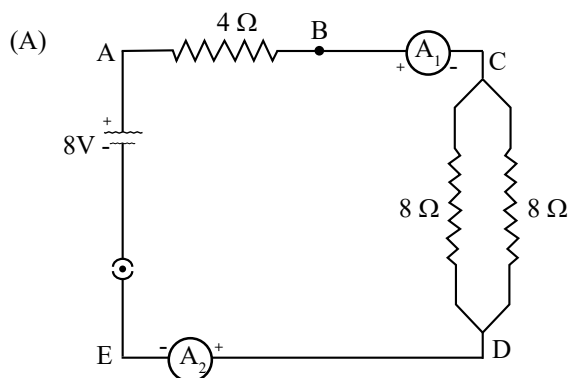
$$\frac{1}{f} = -\frac{2}{20} + \frac{1}{20} = -\frac{1}{20}$$

4. Solve for f :

$$f = -20 \text{ cm}$$

(2 M)

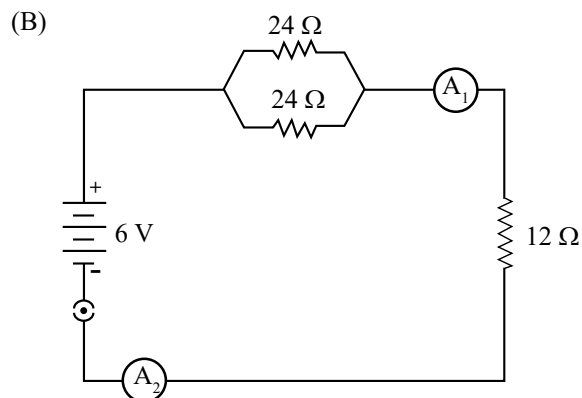
34. Attempt either option (A) or (B).



Find out the following in the electric circuit given in the figure-

- (i) Effective resistance of two 8 ohm resistors in the combination.
- (ii) Current flowing through the 4-ohm resistor

OR



Study the circuit and find out-

- (i) Current in 12 ohm resistor
- (ii) Difference in the readings of ammeter A₁ and A₂ if any

Sol. Students to attempt either option (A) or (B).

(A) (i) $R = \frac{R_1 R_2}{R_1 + R_2} = \frac{8 \times 8}{8 + 8} = 4 \text{ ohms}$

(ii) $I = \frac{V}{R} = \frac{8}{(4 + 4)} = 1 \text{ A}$

OR

$$(B) (i) \frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{24} + \frac{1}{24} = \frac{2}{24}$$

$$R_p = 12 \text{ ohms}$$

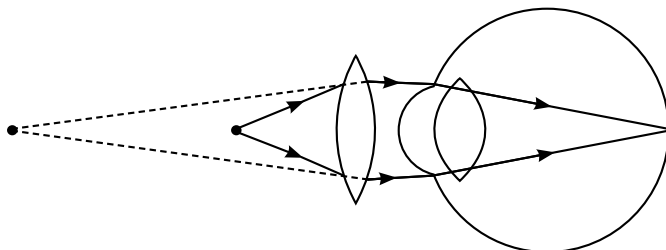
$$R_T = R_p + 12 = 24 \text{ ohms}$$

$$I = \frac{V}{R} = \frac{6}{24} = 0.25 \text{ A}$$

(ii) Same readings of A_1 and A_2

(2 M)

35.



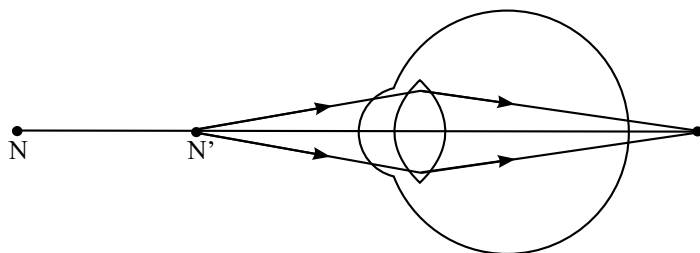
The above image shows a corrective measure for a particular defect of vision.

(i) Identify the defect of vision and state what kind of lens is used to correct this deficiency.

(ii) Draw and label a ray diagram that shows the defect of vision in the above case before correction.

Sol. (i) Hypermetropia is the deficiency in vision and the lens is convex lens.

(ii)



(3 M)

36. A student needs to make a 0.12Ω resistor. She has some copper wire of 0.80 mm diameter. Resistivity of copper is $1.8 \times 10^{-8} \Omega \text{m}$

(i) Determine the cross-sectional area of the wire.

(ii) Calculate the length of wire required for the 0.12Ω resistor.

Sol. (i) Show that the cross-sectional area of the wire is about $5 \times 10^{-7} \text{ m}^2$.

The cross-sectional area A of a wire with diameter d is given by:

$$A = \pi \left(\frac{d}{2} \right)^2$$

Substitute, $d = 0.80 \times 10^{-3} \text{ m}$:

$$A = \pi \left(\frac{0.80 \times 10^{-3}}{2} \right)^2$$

$$A = \pi (0.40 \times 10^{-3})^2$$

$$A = \pi (0.16 \times 10^{-6}) \text{ m}^2$$

$$A \approx 3.14 \times 0.16 \times 10^{-6} \text{ m}^2$$

$$A \approx 5.024 \times 10^{-7} \text{ m}^2$$

Thus, the cross-sectional area A is approximately $5 \times 10^{-7} \text{ m}^2$

(ii) To find the length l of the wire, we can use the formula of resistance:

$$R = \frac{\rho \cdot l}{A}$$

Rearrange to solve for l :

$$l = \frac{R \cdot A}{\rho}$$

Substitute the values:

$$l = \frac{0.12 \cdot 5 \times 10^{-7}}{1.8 \times 10^{-8}}$$

$$l = \frac{6 \times 10^{-8}}{1.8 \times 10^{-8}}$$

$$l = \frac{6}{1.8} \text{ m}$$

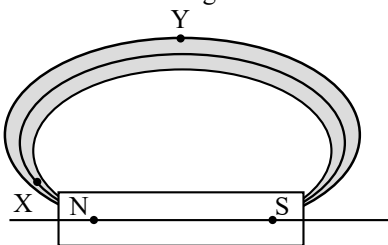
$$l = 3.33 \text{ m}$$

The student needs a length of approximately 3.33 m of given copper wire to make a 0.12Ω resistor.

(3 M)

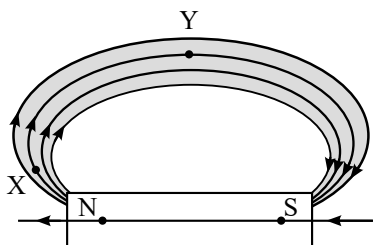
37. Magnetic field lines are shown in the given diagram. A student makes a statement that the magnetic field at X is stronger than at Y.

- Explain with reason if the student's claim is correct.
- Also redraw the diagram and mark the direction of magnetic field lines.



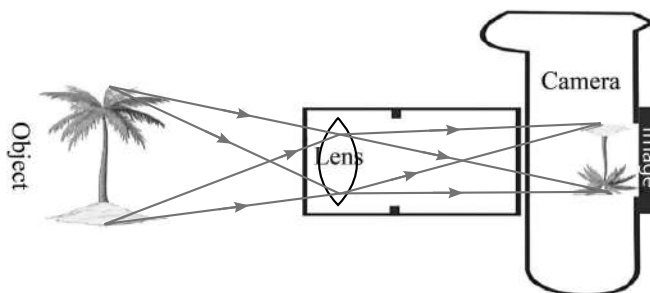
Sol.

- Closeness of magnetic field lines is directly related to strength of magnetic field.
- Strength of magnetic field at point X (pole) is more than point Y.
- If the student redraws the diagram he/she should mark arrows correctly from North to South.



(3 M)

38.



The above image is that of a Digital Single Lense Reflector (DSLR) Camera which are used to take high resolution photographs by professional photographers. The second image of the above two is a schematic diagram of how an image is formed on the sensor of the camera. Based on your understanding of the lenses, answer the following questions.

(a) What type of lens is used in the DSLR camera shown in the image?

(b) What type of image is formed on the sensor?

Attempt either subpart (c) or (d).

(c) A photographer is using a DSLR camera with a lens of focal length $f = 50$ mm to take a close-up photograph of a small object. The lens projects an image onto the camera sensor that is located 60 mm behind the lens. Calculate the object distance (i.e., the distance between the object and the lens).

OR

(d) A photographer is using a DSLR camera to take a picture of a flower. The flower is positioned 150 mm away from the camera lens. The actual height of the flower is 80 mm, and the image height formed on the camera's sensor is measured to be 20 mm. Calculate the focal length of the camera lens.

Sol. (a) Convex Lens

(b) Real and Inverted

Students to attempt either subpart (c) or (d).

(c) To find the object distance (u) for the lens, we can use the lens formula:

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

where:

- $f = 50$ mm (focal length),
- $v = 60$ mm (image distance),
- u is the object distance, which we need to calculate.

Rearranging the formula to solve for u :

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

Substitute the values:

$$\frac{1}{u} = \frac{1}{60} - \frac{1}{50}$$

Calculate each term:

$$\frac{1}{u} = \frac{50 - 60}{3000} = \frac{-10}{3000} = -\frac{1}{300}$$

Thus, the negative sign indicates that the object is located 300 mm in front of the lens (on the opposite side from the image).

So, the object distance is:

$u = 300$ mm

OR

(d) image height = -20 mm

object height = 80 mm

The magnification (m) of the lens is given by:

$$m = \frac{\text{image height}}{\text{object height}}$$

Substituting the values:

$$m = \frac{-20 \text{ mm}}{80 \text{ mm}} = -\frac{1}{4}$$

Thus, the magnification $m = -0.25$ mm.

Magnification is also given by:

$$m = \frac{v}{u}$$

where:

- v is the image distance
- $u = -150$ mm

Rearrange to solve for v :

$$v = m \times u = -0.25 \times -150 \text{ mm} = 37.5 \text{ mm}$$

So, the image distance $v = 37.5$ mm.

The lens formula is:

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

Substituting the values of v and u :

$$\frac{1}{f} = \frac{1}{37.5} + \frac{1}{150}$$

Converting to a common denominator:

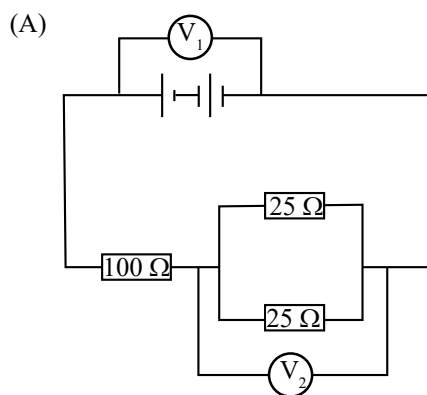
$$\frac{1}{f} = \frac{4+1}{150} = \frac{5}{150} = \frac{1}{30}$$

Thus, $f = 30$ mm

Answer: The focal length of the camera lens is 30 mm.

(4 M)

39. Attempt either option (A) or (B).

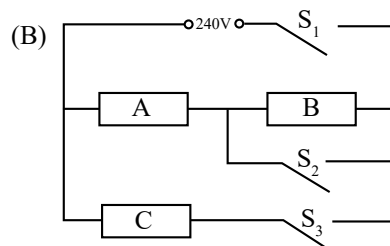


The arrangement of resistors shown in the above figure is connected to a battery.;

The power dissipation in the 100Ω resistor is 81 W. Calculate

- the current in the circuit
- the reading in the voltmeter V_2
- the reading in the voltmeter V_1

OR



An electric heater consists of three similar heating elements A, B and C, connected as shown in the figure above. Each heating element is rated as 1.2 kW, 240 V and has constant resistance. S_1 , S_2 and S_3 are respective switches.

The circuit is connected to a 240 V supply.

- (i) Calculate the resistance of one heating element.
- (ii) Calculate the current in each resistor when only S_1 and S_3 are closed.
- (iii) Calculate the power dissipated across A when S_1 , S_2 and S_3 are closed.

Sol. Students to attempt either option (A) or (B).

(5 M)

(A) (i) Power across the $100\ \Omega$ resistance = 81 W

$$P = I^2 R = 81\ \text{W}$$

$$\therefore I^2 = \frac{81}{100}$$

$$\therefore I = \sqrt{\frac{81}{100}} = \frac{9}{10} = 0.9\ \text{A}$$

(ii) Voltage across the $25\ \Omega$ resistors = $V_2 = IR_{\text{eqv}}$ for the $25\ \Omega$ resistors

$$\frac{1}{R_{\text{eqv}}} = \frac{1}{25} + \frac{1}{25} = \frac{2}{25}$$

$$\therefore R_{\text{eqv}} = \frac{25}{2} = 12.5\ \Omega$$

$$\therefore V_2 = 0.9\ \text{A} \times 12.5\ \Omega = 11.25\ \text{V}$$

(iii) Voltage across $100\ \Omega = V_{100} = IR = 0.9\ \text{A} \times 100\ \Omega = 90\ \text{V}$

$$\therefore V_1 = 90\ \text{V} + 11.25\ \text{V} = 101.25\ \text{V}$$

OR

(B) (i) $P = \frac{V^2}{R}$

(5 M)

$$\therefore R = \frac{V^2}{P} = \frac{240 \times 240}{1200} = 48\ \Omega$$

(ii) For S_1 and S_3 closed

– Current in C

$$V = IR \text{ (Ohm's Law)}$$

$$\therefore I = \frac{V}{R} = \frac{240\ \text{V}}{48\ \Omega} = 5\ \text{A}$$

– Current in A and B

$$V = IR \text{ (Ohm's Law)}$$

$$\therefore I = \frac{V}{R} = \frac{240\ \text{V}}{96\ \Omega} = 2.5\ \text{A}$$

(iii) Power across A for S_1 , S_2 , S_3 closed

$$P_A = I^2 R = 5^2 \times 48 = 1200\ \text{W} = 1.2\ \text{KW}$$

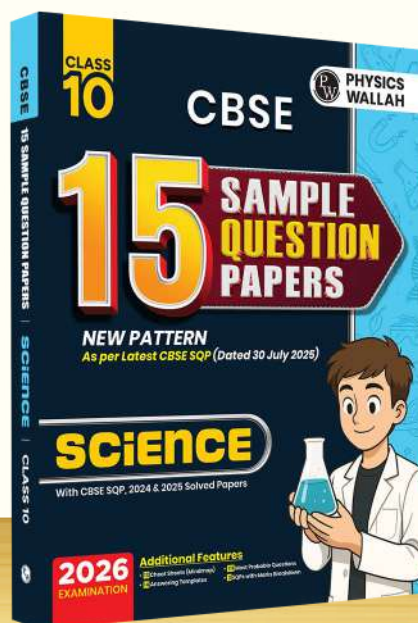
(5 M)

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Candidates must write the Q.P. Code on the title page of the answer book.

SAMPLE QUESTION PAPER-I

SCIENCE

Time allowed : 3 hours

Maximum Marks : 80

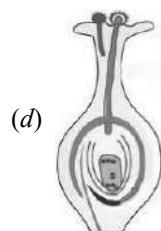
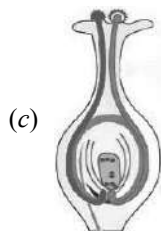
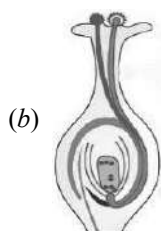
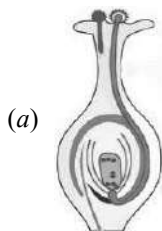
GENERAL INSTRUCTIONS:

Read the following instructions very carefully and strictly follow them :

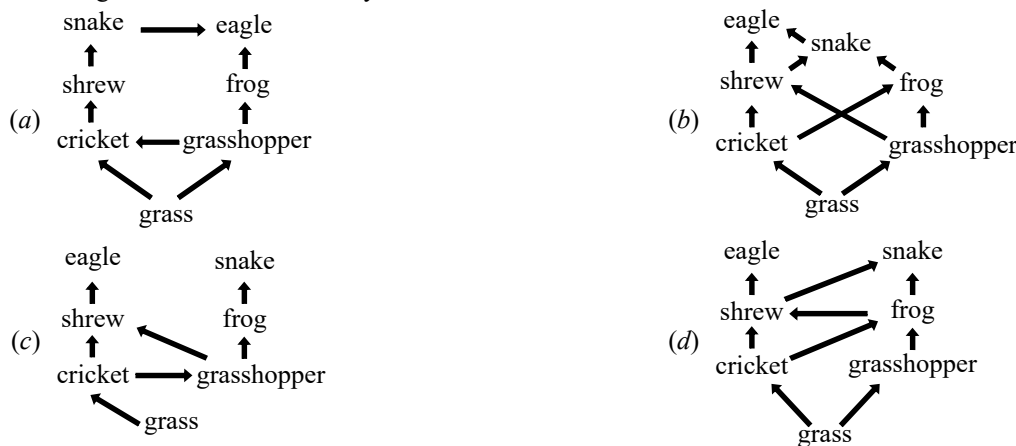
- (i) This question paper comprises **39** questions divided into **three sections: Section A – Biology (Q.1–16), Section B – Chemistry (Q.17–29), and Section C – Physics (Q.30–39).**
- (ii) All questions are **compulsory**. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
- (iii) **Multiple Choice Questions (Q.1–9, Q.17–24, Q.30–32) carry 1 mark each.**
- (iv) **Very Short Answer Type Questions (Q.10–12, Q.25, Q.33–34) carry 2 marks each.** Answers to these questions should be in the range of **30 to 50** words.
- (v) **Short Answer Type Questions (Q.13–14, Q.26–27, Q.35–37) carry 3 marks each.** Answers to these questions should be in the range of **50 to 80** words.
- (vi) **Source-based/Case-based Questions (Q.15, Q.28, Q.38) carry 4 marks each with sub-parts.**
- (vii) **Long Answer Type Questions (Q.16, Q.29, Q.39) carry 5 marks each.** Answers to these questions should be in the range of **80 to 120** words.

SECTION - A

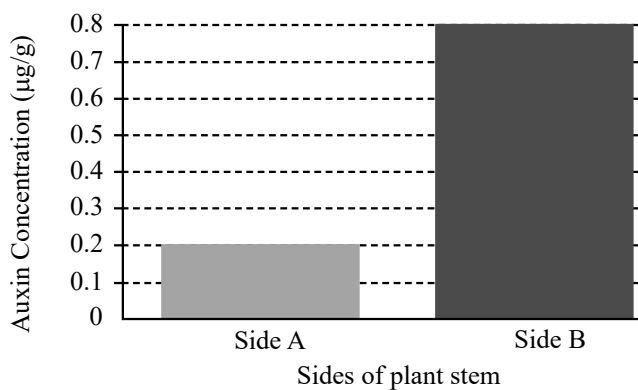
- | | |
|---|---|
| 1. Filtration unit of kidney is | 1 |
| (a) Ureter (b) Urethra (c) Neuron (d) Nephron | |
| 2. During contraction, what prevents the backflow of blood inside the heart? | 1 |
| (a) Valves in heart (b) Thick muscular walls of ventricles | |
| (c) Thin walls of atria (d) Thick walls of atria | |
| 3. Identify the parts of the brain included in the hindbrain: | 1 |
| (a) Cerebellum, medulla, pons (b) Cerebellum, hypothalamus, pons | |
| (c) Medulla, cerebrum, pons (d) Medulla, hypothalamus, pons | |
| 4. Anita is studying the germination process in angiospermic flowers for her biology exam. Her teacher, Mr. Sharma, shows her several diagrams depicting different pathways of pollen tube growth and asks her to identify the correct one. Which of the following shows the correct pathway of germination in the angiospermic flower? | 1 |



5. In his experiments, Mendel crossed tall pea plants with dwarf pea plants. The pea plants produced in F_1 generation were: 1
- (a) All of them were tall (b) All of them were of medium height
- (c) Both tall and dwarf (d) All of them were dwarf
6. In a classroom, a biology teacher explained food webs in ecosystems and drew four different food webs on the board as given in the question. She then asked Neha to select the food web that most accurately represents a natural ecosystem. Which of the following food webs is most likely to exist in nature? 1



7. A study records the concentration of auxin in different sides of a plant stem. The auxin concentrations are represented in the graph below: 1



Based on the graph, what is the likely outcome of this auxin distribution on the plant's growth?

- (a) The plant will grow uniformly (b) The plant will bend towards Side A
- (c) The plant will bend towards Side B (d) The plant will stop growing

The following two questions consist of two statements – **Assertion (A)** and **Reason (R)**. Answer these questions by selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
- (b) Both A and R are true, and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

8. **Assertion (A):** Ozone layer is getting depleted at upper atmosphere which is a cause of concern.

Reason (R): CFC reacts with ozone and breaks it.

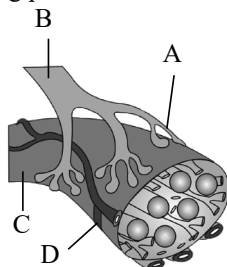
1

9. **Assertion (A):** Hybrid is formed by cross between two organisms that are different in one or more than one traits.

Reason (R): Mendel crossed two plants differing in one trait to obtain F_1 plants which is monohybrid cross.

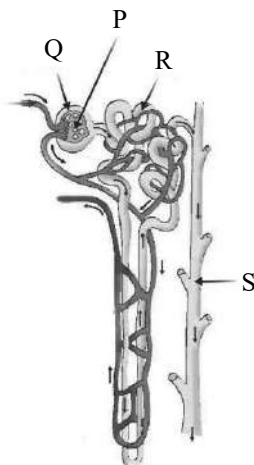
1

10. Dr. Suman is treating two patients: 2
Patient 1: Suffering from an endocrine disorder, affecting hormone secretion necessary for carbohydrate, protein, and fat metabolism.
Patient 2: Suffering with anxiety issues.
 Based on your understanding, answer the following question:
 (a) Name the concerned gland in the case of Patient 1.
 (b) Name the concerned gland in the case of Patient 2 and state one of its functions.
 11. (A) Identify the given figure and label the following parts. 2



OR

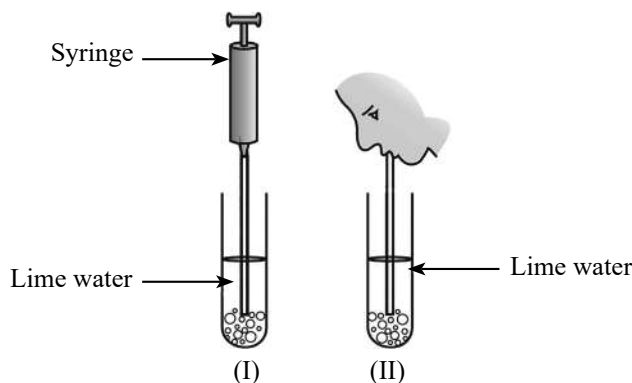
- (B) List two differences between the movement of leaves of a sensitive plant and the movement of a shoot towards light. 2
 12. While Neha strolled through a colorful meadow on a sunny day, she saw some butterflies fluttering around the flowers. Can you share what this activity is all about? State any two abiotic agents of this activity apart from butterflies? 2
 13. "Reproduction is one of the most important characteristics of living beings". Give three reasons in support of the statement. 3
 14. (a) Jyoti is at a campsite in the mountains. After having a snack, she's left with an apple core and a plastic wrapper. Which item is biodegradable, and which one is non-biodegradable? Provide reasons for your choices. 2
 (b) Explain how managing these types of waste is crucial in minimizing environmental pollution. 3
 15. Aastha has a female labrador pet dog called Christie. Christie is a brown color labrador which is a recessive trait. In labrador black color fur is dominant to brown color. Aastha took Christie to the breeder. The breeder assures Aastha that Bruno will be the father of Christie's pups. After few months, Christie gives birth to 8 pups out of which 4 are black furred and 4 are brown furred. Based on this information, answer the following questions:
 (a) What color was Bruno? 1
 (b) What is the genotype of Bruno? State the reason for the answer. 2
 (c) Write all the possible genotypes of Christie's pups. 1
OR
 (c) If Christie were bred with another brown-furred dog, Max, what would be the expected fur color ratio of the pups? 1
 16. (A) The diagram provided shows the structure of a nephron and its various parts labeled P, Q, R, and S. Based on the diagram answer the following questions: 5



- Identify the parts labeled P, Q, R, and S in the diagram.
- Describe the process of filtration and reabsorption in the nephron, explaining the role of each labeled part (P, Q, R, and S).
- Explain the importance of selective reabsorption in maintaining homeostasis in the body.

OR

- (B) (a) In the given experimental setup, diagram (I) uses atmospheric air passed into lime water, and diagram (II) uses exhaled air. Explain the difference in the time it takes for lime water to turn milky in both diagrams.

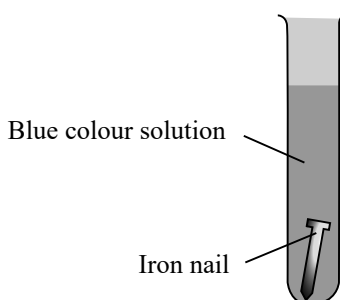


- Draw a diagram of an open stomatal pore and label (i) Guard cells and (ii) Chloroplasts. State two functions of stomata.

5

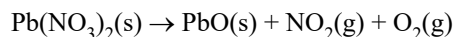
SECTION - B

17. Sheena took a piece of iron (Fe) nail and placed it in a blue solution. After some time, she noticed that the blue colour of the solution faded away, and a brown solid was observed on the iron nail. What can Sheena conclude from her experiment? 1



- Iron (Fe) is less reactive than copper (Cu).
 - Iron (Fe) displaces copper (Cu) from its solution.
 - Copper (Cu) is more reactive than iron (Fe).
 - Copper (Cu) displaces iron (Fe) from its solution.
18. Imagine you are a chemist studying the decomposition of lead nitrate ($\text{Pb}(\text{NO}_3)_2$) when heated, which produces lead(II) oxide (PbO), nitrogen dioxide (NO_2), and oxygen (O_2). You need to determine the correct ratio of the products in the balanced chemical equation.

Given the unbalanced equation:



1

Determine the correct ratio (a : b : c) of the products PbO, NO_2 , and O_2 .

- a : b : c = 1 : 2 : 1
- a : b : c = 2 : 1 : 1
- a : b : c = 1 : 1 : 2
- a : b : c = 2 : 4 : 1

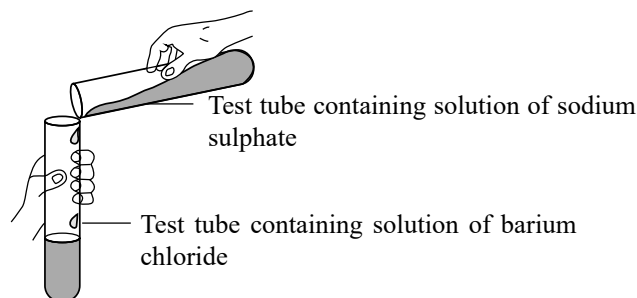
19. Rohit was in the midst of a home renovation project, and he turned to a knowledgeable friend in construction for advice. To ensure a smooth and long-lasting wall surface in his newly renovated room, which material should he select from the following options? 1

- (a) Calcium sulphate hexahydrate (b) Calcium carbonate
(c) Calcium sulphate hemihydrate (d) Calcium hydroxide

20. Which of the following represents the correct formula of sodium chloride? 1

- (a) $\text{Na}^+ \begin{bmatrix} \times \times \times \\ \times \text{Cl} \times \\ \times \times \times \end{bmatrix}$ (b) $\text{Na}^+ 2 \begin{bmatrix} \times \times \times \\ \times \text{Cl} \times \\ \times \times \times \end{bmatrix}$ (c) $2 \text{Na}^+ \begin{bmatrix} \times \times \times \\ \times \text{Cl} \times \\ \times \times \times \end{bmatrix}$ (d) $2 \text{Na}^+ \begin{bmatrix} \times \\ \times \text{Cl} \times \\ \times \times \times \end{bmatrix}$

21. 1



Identify the solid product formed in this reaction.

- (a) Barium chloride (b) Barium sulphate (c) Sodium chloride (d) Sodium sulphate

22. In tamarind and nettle sting, the name of acids present respectively are: 1

- (a) Citric acid and tartaric acid (b) Tartaric acid and citric acid
(c) Tartaric acid and methanoic acid (d) Methanoic acid and tartaric acid

23. You are conducting an experiment in a chemistry lab to identify the structure of different hydrocarbon compounds. Your instructor presents a scenario involving a three-carbon alkyne.

If the three-carbon skeleton is of a straight-chained alkyne, how many carbon atoms may NOT be bonded to any hydrogen atoms? 1

- (a) 1 (b) 2 (c) 0 (d) 3

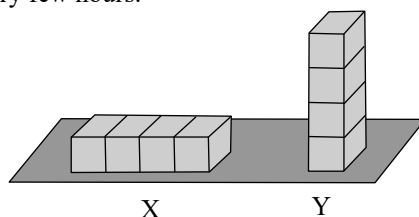
The following two questions consist of two statements – **Assertion (A)** and **Reason (R)**. Answer these questions by selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, and R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

24. **Assertion (A):** Formation of rust on iron is a chemical change.

Reason (R): Rust is formed when iron reacts with oxygen and water in the presence of air. The resulting iron oxide is chemically different from the original iron, making it a chemical change. 1

25. Eight identical iron blocks are placed on the ground in the two arrangements X and Y as shown below. The block arrangement are kept moist by sprinkling water every few hours. 2



Which of the arrangements is likely to gather more rust after ten days? Justify your answer.

26. (A) Some salt samples are given below. Find out their chemical formula, their solubility in water, check the action on blue litmus paper, and the name of the acids and bases used to form them.

Potassium nitrate, aluminium chloride, zinc sulphate

3

OR

- (B) In a chemistry lab, students are exploring the properties and reactions of various substances used in everyday products. The instructor provides the students with three substances labelled X, Y, and Z, and gives them the following information:

- Substance X is a common ingredient used in antacids and is also used in the kitchen.
- When substance X is heated, it decomposes to give W, Y, and V
- W upon recrystallisation, forms substance Z.
- Substance Z is used in the manufacture of borax.
- When substance W reacts with an acid A, it produces a gas called V.

(a) Write your observations:

(i) if methyl orange is added to an aqueous solution of 'W'.

(ii) if a drop of red litmus solution is added to the aqueous solution of 'V'.

(b) Identify the substance 'Z'.

3

27. An ore on treatment with dil. HCl gives off the smell of rotten eggs. Name the type of this ore. How can the metal be obtained from its concentrated ore?

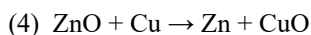
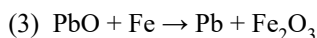
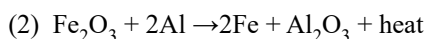
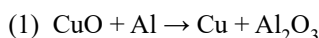
3

28. You are working as a metallurgist in a lab where you are tasked with studying the reactivity and extraction processes of various metals. During one of your experiments, you obtain a reddish-brown metal oxide (Y) along with two gases SO_2 and SO_3 from its anhydrous sulphate salt by heating. You then react this oxide with a metal (X), whose oxide is known to be amphoteric. The reaction results in the reduction of the metal oxide (Y) to metal (A).

(a) Based on the reactivity series of metals, identify the likely positions of metals X and A in the series (top, middle, or bottom). Provide a justification for your answer.

2

(b) (i) Which one is the correct chemical equation representing the reaction between metal oxide (Y) and metal (X), whose oxide is amphoteric?



(ii) Which of the following best explains the practical application of the reaction between Fe_2O_3 and Al in metallurgy?

(1) It is used to manufacture copper wires.

(2) It is an example of alloy formation.

(3) It is used in thermite welding to join railway tracks.

(4) It is used in electroplating of metals.

OR

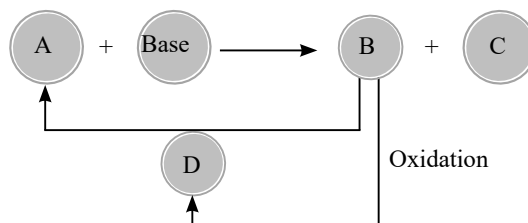
(b) Describe the colour change you would expect to observe during the reaction between metal oxide (Y) and metal (X). Provide an explanation for the observed colour change.

2

29. (A) You are performing a series of chemical reactions in the laboratory:

1. When a base reacts with compound 'A', it produces two compounds, 'B' and 'C'.
2. When compound 'B' reacts with compound 'D', it reforms compound 'A'.
3. Additionally, the oxidation of compound 'B' produces compound 'D'.





- (a) Identify compounds 'A', 'B', 'C', and 'D'.
 (b) Identify and describe the reaction that occurs when the base reacts with compound 'A'.

5

OR

(B) A student performed a series of experiments in the laboratory:

- In the first test tube, she added a small strip of zinc metal to a solution of dilute hydrochloric acid and noticed bubbles forming.
 - In the second test tube, she added sodium hydroxide to the same acid and observed the changes.
 - In a third test tube, a sweet-smelling liquid (compound Z) is formed from a carboxylic acid ($C_2H_4O_2$) and an alcohol (C_2H_6O) in the presence of a few drops of concentrated sulphuric acid.
- (a) (i) Identify the type of reaction between zinc and dilute hydrochloric acid.
 (ii) Write the balanced chemical equation for this reaction.
- (b) (i) Name the type of reaction between sodium hydroxide and hydrochloric acid.
 (ii) Write the balanced chemical equation for this reaction.
- (c) (i) Identify compound Z.
 (ii) Write the names of the acid and the alcohol used to form Z.
 (iii) Write the balanced equation for the formation of Z.
- (d) Why is concentrated sulphuric acid used in the formation of compound Z?

SECTION - C

30. Sonu observes a ray which seems to be traveling through the focus of a convex mirror passes _____ after reflection 1
- (a) parallel to the principle axis
 (b) along the same path in opposite direction
 (c) through F
 (d) through C
31. Consider the following statements and choose the correct choice. 1
- (A) In series connection, the same current flows through each element.
 (B) In parallel connection, the same potential difference gets applied across each element.
- (a) Both (A) and (B) are correct
 (b) (A) is correct but (B) is wrong
 (c) (A) is wrong but (B) is correct
 (d) Both (A) and (B) are wrong

The following two questions consist of two statements – **Assertion (A)** and **Reason (R)**. Answer these questions by selecting the appropriate option given below:

- (a) Both A and R are true, and R is the correct explanation of A.
 (b) Both A and R are true, and R is not the correct explanation of A.
 (c) A is true but R is false.
 (d) A is false but R is true.

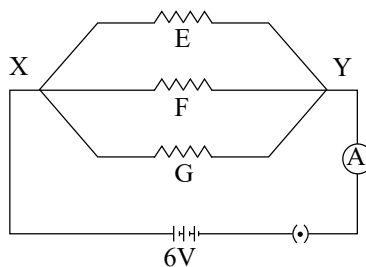
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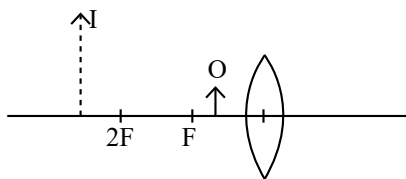
- 32. Assertion (A):** A rainbow appears in the sky after a rain shower due to dispersion of sunlight by tiny water droplets in the atmosphere.
Reason (R): The water droplets act as small prisms, refracting and dispersing sunlight, which is then reflected internally and refracted again before reaching the observer's eye. 1
- 33.** A light ray is incident on a concave mirror with a radius of curvature of 20 cm. If the object distance is 15 cm, calculate the image distance. 2
- 34. (A)** Two wires of the same material have their lengths in the ratio of 1 : 2 and diameters in the ratio of 2 : 1. What is the ratio of their resistances? 2

OR

- (B)** A current of 2 A flows through a wire of resistance $10\ \Omega$. Calculate the potential difference across the wire. 2
- 35.** State the cause of dispersion of white light by a glass prism. How did Newton, using two identical glass prisms, explained that white light is made of seven colours? Draw a ray diagram to show the path of a narrow beam of white light, through a combination of two identical prisms arranged together in inverted position with respect to each other, when it is allowed to fall obliquely on one of the faces of the first prism of the combination. 3
- 36.** You are working on a school project at home where you need to design a circuit with a specific resistance. You have five resistors, each with a resistance of $\frac{1}{5}\ \Omega$.
 What is the maximum and minimum resistance which can be made using five resistors each of $\frac{1}{5}\ \Omega$? 3
- 37.** Riya is assembling an electric lamp for her science fair project. She needs to choose a suitable material for the filament to ensure the lamp works efficiently and lasts a long time. After researching, she learns that a specific material is commonly used for this purpose.
 Riya wants to know the name of the material and why this particular material is used almost exclusively for the filament of electric lamps. 3
- 38.** Three resistors in a circuit are attached as shown here. The resistance of F and G are 10 ohm and 5 ohm respectively. The resistance of E is unknown. These resistors are connected to a battery with potential difference 6 V.



- (a) What is the term used to describe such an arrangement of resistors? 1
- (b) What is the resistance of E if 0.3 A current flows through it? 2
- (c) What is the total current flowing in the circuit? 1
- OR**
- (c) Should the resistance of an ammeter be low or high? 1
- 39. (A)** Rakhi placed an object O in front of a lens and its image is I. Without actually drawing the ray diagram, Rakhi has to explain the following:



- (i) Type of lens (Converging/Diverging)
- (ii) Two optical instruments where such an image is obtained.
- (iii) Three characteristics of the image formed if this lens is replaced by a concave mirror of focal length 'f' and an object is placed at a distance $f/2$ in front of the mirror. 5

OR

- (B)** A rod of length 10 cm lies along the principal axis of a concave mirror of focal length 10 cm in such a way that the end close to the pole is 20 cm away from it. Find the length of the image of the rod. 5

SAMPLE QUESTION PAPER-I

(Explanations)

Marking Scheme (Ques 1-9)

10 Min

☞ Each question carries 1 mark.

1. (d) Nephron filters blood in the kidney and therefore is called the filtration unit of kidney.
2. (a) Valves within the heart act as one-way gates. They open to allow blood flow during contraction and close to prevent backflow, ensuring efficient circulation and maintaining proper blood flow direction.
3. (a) The hindbrain includes the cerebellum, medulla oblongata, and pons.
4. (a) Diagram (a) is correct as it shows the pollen tube growing through the style to the ovary for fertilization. Only one pollen tube enter the embryo sac and carries male gamete to the egg in the ovary.
5. (a) Tall character is dominant over dwarf (recessive trait) hence in F_1 generation all plants were tall in Mendel's experiments.
6. (b) Image B represents the correct food web of the ecosystem because it accurately sequences the flow of predators and prey, and shows interconnected relationships where one prey has multiple predators, reflecting natural environmental dynamics.
7. (b) Auxin accumulates on the shaded side of the plant (Side B), promoting cell elongation. This differential growth causes the plant to bend towards the side with less auxin concentration (Side A). This mechanism helps the plant to grow towards light, enhancing photosynthesis efficiency.
8. (a) In the stratosphere ozone layer is present, which protects us from harmful ultraviolet (UV) radiations coming from the Sun.
When CFC reacts with ozone it breaks the molecule of ozone leading to the depletion of this layer and exposing us to harmful radiations.
9. (b) Hybrid is the offspring which have the quality of both the parental generation. One trait should be different for the monohybrid cross.
The reason is true, but it is not the explanation of assertion, because it is written that Mendel did a monohybrid cross, but the reason of getting hybrid is not mentioned which is recombination.

10.

Marking Scheme

4 Min

- | |
|---|
| (a) Concerned gland name in the case of patient 1. ($\frac{1}{2}$ M) |
| (b) Concerned gland name in the case of patient 2. ($\frac{1}{2}$ M) |
| Function of concerned gland for patient 2. (1 M) |

- (a) The gland concerned in the case of patient 1 seems to be the thyroid gland.
- (b) The gland concerned in the case of patient 2 might be the adrenal gland.
One of its functions includes secreting adrenaline, which prepares the body for a 'fight or flight' response by increasing the heart rate and supplying more oxygen to muscles.



Key Takeaways

From this question, students will understand the specific roles of endocrine glands and will be able to recognize the connection between symptoms and gland functions, ensuring accurate answers in similar questions.

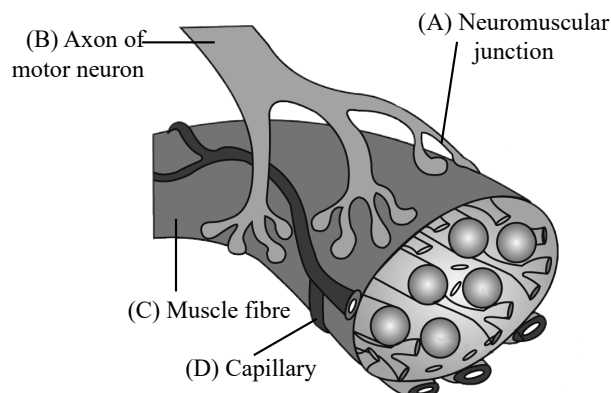
11.

Marking Scheme

2 Min

- | |
|--------------------------------------|
| ☞ Identifying the figure (1 M) |
| ☞ Labeling each part correctly (1 M) |

(A) The figure is showing the neuromuscular junction.



OR

Marking Scheme

2 Min

☞ Mention the differences

(1+1 M)

(B) Leaves of a sensitive plant	Shoot towards light
Immediate response to touch and no growth is involved in this movement	Slow-growth movement and dependent on light and is caused by elongation of cells on the shaded side of the shoot.
Movement is due to changes in the amount of water in the cells, causing them to swell or shrink	Movement is due to directional growth of the plant part towards the environmental stimulus (light)

Topper's Explanation

(CBSE, 2023)

a) Movement of leaves of a sensitive plant	Movement of a shoot towards light
1. This is not a growth related movement and is due to a stimulus (Nastic movement)	1. This is a growth related movement (Tropic movement)
2. This is non-directional.	2. This is directional movement
3. Movement is carried out by movement of water which is taken from the leaves to cover part. This causes the leaf to shrink.	3. Movement is carried out due to hormone like Auxin which diffuses to area of shoot away from sunlight and regulates cell elongation in area of shoot present in the shade, which causes the plant to bend towards sunlight.

12.

Marking Scheme

3 Min

☞ Describe the activity

(1 M)

☞ Name two agents involved in this activity

(1 M)

The butterflies were engaged in pollination which involves transfer of pollen grains from the anther (male reproductive structure) to the stigma (female reproductive structure) of a flower.

Apart from butterflies, water and wind are common abiotic agents facilitating this process.

13.

Marking Scheme

4 Min

☞ Three reasons supporting reproduction's importance.

(1+ 1+ 1 M)

Reproduction is one of the most important characteristics of living beings. Here are three reasons in support of the statement:

1. Continuation of species: Reproduction ensures the continuation of various species on Earth. In the absence of reproduction, species will not be able to exist for a long time and may soon get extinct.
2. Genetic variation: Reproduction allows for genetic variations, within a species by introducing new combinations of genes through sexual reproduction, mutation and genetic recombination.
3. Evolution: Variations produced during reproduction are the basis of evolution. Over time, genetic variations and natural selection lead to the emergence of new species.

Topper's Explanation

(CBSE 2017)

11. → Reproduction is an important characteristic of living beings because :-
1) It promotes continuity of life.
2) It promotes stability of species.
3) It includes creation of variations that are the basis of evolution.
4) It regulates population.



Mistakes 101 : What not to do!

Students might provide insufficient or vague reasons for why reproduction is important, lacking specific details or examples.

14.

Marking Scheme

5 Min

(a) Identification of the biodegradable and non-biodegradable item

(½ + ½ M)

Reasoning for each choice

(½ + ½ M)

(b) Importance of managing biodegradable waste

(½ M)

Importance of managing non-biodegradable waste

(½ M)

- (a) The apple core is biodegradable because it is an organic material and can naturally decompose over time, returning nutrients to the soil.

The plastic wrapper is non-biodegradable because plastics are inert materials and take hundreds of years to break down. Thus, it can harm the environment if not properly disposed of.



- (b) Managing these types of waste is crucial to minimize environmental pollution. Biodegradable waste can be composted or used for producing biogas, reducing the need for landfill space.

Non-biodegradable waste should be recycled or properly disposed of in designated waste management systems to prevent them from accumulating in the environment, causing pollution and harming wildlife.

15.

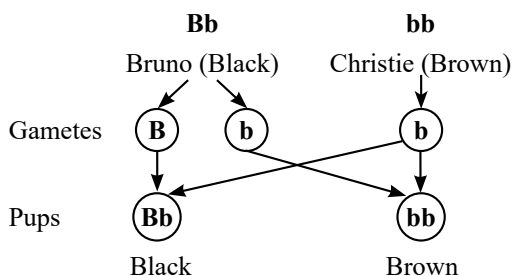
Marking Scheme



13 Min

- | | |
|--|-------|
| (a) Color of Bruno | (1 M) |
| (b) Identification of the genotype | (1 M) |
| Explanation for the identification. | (1 M) |
| (c) All the possible genotypes of Christie's pups. | (1 M) |
| OR | |
| (c) Mention the expected fur color ratio of the pups with explanation. | (1 M) |

- (a) Bruno was black color dog. Since black color is the dominant trait, it showed in half of the pups.
- (b) The genotype of Bruno is Bb (heterozygous). If it was homozygous, all the pups would have been black color. It can be explained by the following cross:



- (c) The possible genotypes of Christie's pups are - Bb and bb .

OR

- (c) If Christie (bb) were bred with another brown-furred dog, Max (bb), the expected fur color ratio of the pups would be:

bb (brown-furred) = 100%

All the pups would have brown fur since both parents contribute only the recessive b allele.



Mistakes 101 : What not to do!

Students often make mistakes while doing the cross and confuse between dominant color and recessive color. So, read the question properly and write the alleles separately.



Nailing the Right Answer

Draw the cross and then solve this question. It will be very easy that way.

16.

Marking Scheme



16 Min

- | | |
|--|--|
| (a) Name of P, Q, R, and S. | ($\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$ M) |
| (b) Role of P, Q, R, and S in filtration and reabsorption. | ($\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$ M) |
| (c) Explanation of selective reabsorption. | (1 M) |

- (A) (a) • P: Glomerulus
• Q: Bowman's capsule
• R: Tubular part of nephron
• S: Collecting duct
- (b) Filtration: Blood enters the nephron through the glomerulus (P), where blood pressure forces water, ions, and small molecules out of the blood and into the Bowman's capsule (Q), forming the filtrate. Larger molecules and blood cells remain in the bloodstream.
Reabsorption: As the filtrate passes through the tubular part of the nephron (R), essential nutrients, glucose, amino acids, and a significant amount of water are reabsorbed back into the bloodstream. This process is crucial for conserving valuable substances.
The remaining filtrate flows into the collecting duct (S), where further water reabsorption may occur based on the body's hydration needs. The urine then moves to the ureter and is stored in the bladder until excretion.
- (c) Selective reabsorption ensures that essential substances like glucose, amino acids, and water are not lost in the urine. It helps maintain the body's fluid balance, electrolyte levels, and overall homeostasis. This process allows the body to retain necessary nutrients and excrete only the waste products, such as urea and uric acid.

OR

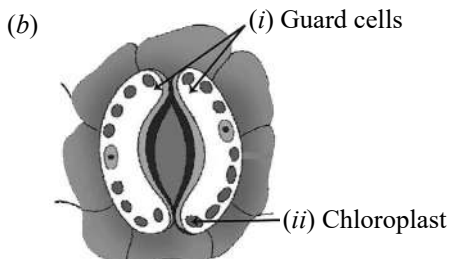
Marking Scheme



16 Min

- | | |
|---|--------------------|
| (a) Mentioning the difference in setup (I) and (II) | (1 M) |
| Explanation for the difference | (1 M) |
| (b) Correct diagram and labeling of an open stomatal pore with: | |
| (i) Guard cells | ($\frac{1}{2}$ M) |
| (ii) Chloroplasts | ($\frac{1}{2}$ M) |
| State two functions of stomata | (1+1 M) |

- (B) (a) The lime water in diagram (II) turns milky faster because exhaled air has a higher concentration of carbon dioxide compared to atmospheric air. Carbon dioxide reacts with lime water (calcium hydroxide) to form calcium carbonate, which causes the milky appearance. Exhaled air, rich in CO_2 from respiration, accelerates this reaction, making the lime water turn milky more quickly.



Two functions of stomata:

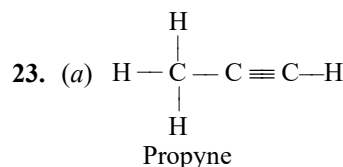
Stomata allow the entry of carbon dioxide for photosynthesis and the release of oxygen as a byproduct.

Stomata facilitate the loss of water vapor from the plant (transpiration), which helps in cooling the plant and also aids in uptake and transport of water and nutrients.

Marking Scheme (Ques 17-24) 12 Min

☞ Each question carries 1 mark.

17. (b) Sheena concludes that since iron lies above Cu in the reactivity series, therefore, it will displace Cu from its salt solution.
18. (d) The balanced chemical equation for the decomposition of lead nitrate ($\text{Pb}(\text{NO}_3)_2$) is:
- $$2\text{Pb}(\text{NO}_3)_2(\text{s}) \xrightarrow{\text{Heat}} 2\text{PbO}(\text{s}) + 4\text{NO}_2(\text{g}) + \text{O}_2(\text{g})$$
- (Lead nitrate) (Lead oxide) (Nitrogen dioxide) (Oxygen)
19. (c) He must select calcium sulphate hemihydrate $\left(\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}\right)$ since, it is used for making surfaces smooth.
20. (a) Electronic configuration of Na = 2, 8, 1
Electronic configuration of Cl = 2, 8, 7
Na will lose an electron (attains positive charge) and Cl will gain one electron (attains negative charge) to achieve stable noble gas configuration.
21. (b) The reaction that occurs is:
- $$\text{Na}_2\text{SO}_4(\text{aq}) + \text{BaCl}_2(\text{aq}) \rightarrow \text{BaSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$$
- Hence, BaSO_4 is present in solid state in the given reaction.
22. (c) In tamarind and nettle sting, acids present are tartaric acid and methanoic acid respectively.



24. (a) The formation of rust on iron is indeed a chemical change. Rust forms when iron reacts with oxygen and water, producing iron oxide. This new substance is chemically distinct from iron, indicating a chemical change has occurred.

25.	Marking Scheme	4 Min
☞	Identify which arrangement is likely to gather more rust.	(1 M)
☞	Provide reason to support the answer.	(1 M)

Arrangement Y is likely to gather more rust.

This is because:

- (i) Rusting is a surface phenomenon. Arrangement Y has a larger surface area exposed to air.
- (ii) Better air circulation: In arrangement Y, there is better air circulation around the blocks, further promoting the rusting process.

26.	Marking Scheme	5 Min
	Provide the following details for the given salts:	
☞	Chemical formula	(1 M)
☞	Solubility in water	(½ M)
☞	Effect on blue litmus paper	(½ M)
☞	Name of the acid used to form it	(½ M)
☞	Name of the base used to form it	(½ M)

- (A) The chemical formula, their solubility in water, the action on blue litmus paper, and the name of the acids and bases used to form them is given in the following table:

Salt	Chemical formula	Solubility in water	Action on blue litmus paper	Acid used	Base used
Potassium nitrate	KNO_3	soluble	no action	HNO_3	KOH
Aluminium chloride	AlCl_3	soluble	blue to red	HCl	$\text{Al}(\text{OH})_3$
Zinc sulphate	ZnSO_4	soluble	blue to red	H_2SO_4	$\text{Zn}(\text{OH})_2$



Mistakes 101 : What not to do!

Students may mistakenly believe that all salts are neutral in nature, while salts may be acidic or basic in nature depending upon the strength of acids and bases used.

OR

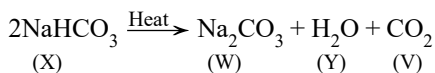
Marking Scheme

5 Min

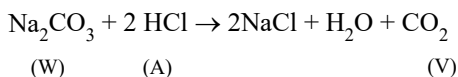
- (a) Identify the nature of aqueous solution of 'W' and 'V' in (i) and (ii). ($\frac{1}{2} + \frac{1}{2} M$)
Mention the colour change observed in (i) and (ii). ($\frac{1}{2} + \frac{1}{2} M$)
- (b) Identification of the substance Z. ($\frac{1}{2} M$)
Write the balanced chemical equation for the formation of Z. ($\frac{1}{2} M$)

- (B) • Substance X is likely sodium bicarbonate (NaHCO_3), which is commonly used in antacids and baking.

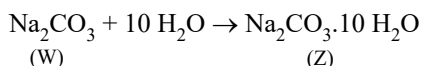
When this substance is heated, following reaction occurs:



- 'W' reacts with an acid such as HCl to produce CO_2 gas ('V')



- (a) (i) Methyl orange is red in acidic solution and yellow in basic solutions. The substance 'W' (Na_2CO_3) is a basic salt. Hence, the solution will turn yellow when methyl orange is added to an aqueous solution of 'W'.
- (ii) When CO_2 ('V') is dissolved in water, it forms carbonic acid (H_2CO_3), which is an acidic solution. Acids turn blue litmus red and does not change colour of red litmus, hence, no colour change will be observed if a drop of red litmus solution is added to the aqueous solution of it.
- (b) 'W' upon recrystallisation, forms washing soda (Z), which is used in the manufacture of borax. Hence, the substance 'Z' is washing soda.



27.

Marking Scheme

5 Min

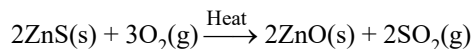
- Identify the type of ore. ($\frac{1}{2} M$)
- Name the method used to concentrate this ore. ($\frac{1}{2} M$)
- Explain the two steps involved in extracting metal from the concentrated ore. (1+1 M)

Smell of rotten eggs is usually produced by the Sulphur. Therefore, the ore is a sulphide ore.

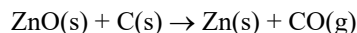
Let us suppose that the ore is Zinc Blende. This sulphide ore is concentrated by froth-floatation process.

The metal is obtained from the concentrated ore in the two steps:

- (i) **Roasting:** Roasting involves heating the ore strongly in the presence of air. The metal sulphide gets converted into metal oxide along with evolution of sulphur dioxide (SO_2) gas.



- (ii) **Reduction with carbon:** The metal oxide on heating with carbon, gets reduced to free metal.



Topper's Explanation

(CBSE 2019)

8. Smell of rotten eggs is usually produced by Sulphur.

∴ It must be a sulphide ore.

Let us suppose that the ore is Zinc Blende (ZnS).

Concentration of ore

First of all, the ore is concentrated by the method of Froth floatation.

Conversion into metal oxide

Then it is ~~roasted~~ converted into its metal oxide via Roasting in supply of excess air.

For eg.:

$$\text{ZnS} + \text{O}_2 \xrightarrow{\text{Roasting}} \text{ZnO} + \text{SO}_2 \uparrow$$

Zinc sulphide ore (excess air) Zinc Oxide Sulphur dioxide (pungent smell)

Conversion into metal

It is then converted into its metal form by using a reducing agent like Carbon, Aluminium etc.

For eg.:

$$\text{ZnO} + \text{C} \xrightarrow{\text{Reduction}} \text{Zn} + \text{CO}$$

Zinc oxide (reducing agent) Zinc metal Carbon monoxide

Carbon (contaminated)

It is further refined to get it in its pure form.

28.

Marking Scheme

12 Min

(a) Identify the positions of metals X and A. ($\frac{1}{2} + \frac{1}{2}$ M)
Provide reasoning in each case. ($\frac{1}{2} + \frac{1}{2}$ M)

(b) Write the balanced chemical reaction. (1 M)
Practical application of this type of reaction in metallurgy. (1 M)

OR

(b) Write the name of the metal oxide (Y) and metal (X). ($\frac{1}{2}$ M)
Mention the observed colour change. ($\frac{1}{2}$ M)
Provide explanation for the observed colour change. (1 M)

- (a) • Metal X is Aluminium (Al), which is positioned at the top of the reactivity series. Aluminium is known for forming an amphoteric oxide (Al_2O_3), which can react with both acids and bases.
- Metal A, which is Iron (Fe), is positioned in the middle of the reactivity series. Iron is less reactive than aluminium, which justifies its reduction by aluminium in the reaction. A reddish-brown oxide (Fe_2O_3) is formed on the heating of anhydrous sulphate (FeSO_4).
- (b) (i) (2) Al is a highly reactive metal and its oxide is amphoteric in nature. It can reduce Fe_2O_3 to Fe.
- (ii) (3) The reduction of metal oxides like Fe_2O_3 by highly reactive metals such as Al is the basis of the thermite reaction used in welding heavy machinery and railway tracks.

OR

- (b) During the reaction between metal oxide (Y), which is iron(III) oxide (Fe_2O_3), and metal (X), which is aluminium (Al), one would observe a colour change from reddish-brown to metallic grey.
Initial Colour: Iron(III) oxide (Fe_2O_3) is a reddish-brown solid.
Final Colour: Upon reduction by aluminium, iron metal (Fe) is formed, which is metallic grey in colour.
The aluminium oxide (Al_2O_3) produced is white.

29.

Marking Scheme

12 Min

(a) Identification of the compounds A, B, C and D. ($4 \times 1 = 4$ M)

(b) Mention the correct name of the reaction involved. ($\frac{1}{2}$ M)
Explain the involved reaction. ($\frac{1}{2}$ M)

(A) (a) Compound 'A': An ester (e.g., ethyl acetate, $\text{CH}_3\text{COOCH}_2\text{CH}_3$)

Compound 'B': An alcohol (e.g., ethanol, $\text{CH}_3\text{CH}_2\text{OH}$)

Compound 'C': A carboxylate salt (e.g., sodium acetate, CH_3COONa)

Compound 'D': A carboxylic acid (e.g., acetic acid, CH_3COOH)

- (b) The reaction that occurs when a base reacts with compound 'A' is called saponification.

Saponification is the process by which an ester reacts with a base to form an alcohol and a carboxylate salt. This reaction is commonly used in the production of soaps.

**Nailing the Right Answer**

To answer correctly, identify each compound based on functional groups and reaction types. Emphasize that compound 'A' is an ester, which reacts with a base to produce an alcohol and carboxylate salt.

**Key Takeaways**

This question demonstrates the importance of understanding reaction pathways, especially saponification and oxidation. Identifying each compound's role helps reinforce concepts related to esters, carboxylates, and alcohols in organic chemistry reactions.

OR**Marking Scheme**

12 Min

(a) (i) Identification of the reaction between zinc and dilute hydrochloric acid. ($\frac{1}{2}$ M)

(ii) Balanced chemical equation for the reaction in (i). ($\frac{1}{2}$ M)

(b) (i) Identification of the reaction between sodium hydroxide and hydrochloric acid. ($\frac{1}{2}$ M)

(ii) Balanced chemical equation for the reaction involved in (i). ($\frac{1}{2}$ M)

(c) (i) Identification of compound Z ($\frac{1}{2}$ M)

(ii) Name of the alcohol and carboxylic acid involved in the reaction. ($\frac{1}{2} + \frac{1}{2}$ M)

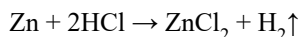
(iii) Balanced chemical equation for the formation of Z ($\frac{1}{2}$ M)

(d) Role of concentrated sulphuric acid in the formation of compound Z. (1 M)



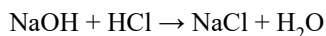
(B) (a) (i) Type: Single Displacement reaction (Zinc displaces hydrogen)

(ii) Equation:



(b) (i) Type: Neutralization reaction

(ii) Equation:

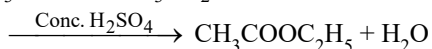


(c) (i) Compound Z: Ethyl ethanoate (an ester)

(ii) Acid used: Ethanoic acid (CH_3COOH)

Alcohol used: Ethanol ($\text{CH}_3\text{CH}_2\text{OH}$)

(iii) $\text{CH}_3\text{COOH} + \text{CH}_3\text{CH}_2\text{OH}$



(d) Sulphuric acid acts as a dehydrating agent and catalyst in the esterification reaction.

Marking Scheme (Ques 30-32)



8 Min

☞ Each question carries 1 mark.

30. (a) parallel to the principle axis

31. (a) Both (A) and (B) are correct

32. (a) A rainbow appears in the sky after a rain shower because sunlight is dispersed by tiny water droplets in the atmosphere. These droplets act as small prisms, refracting and dispersing sunlight into its component colors. The dispersed light then undergoes internal reflection within the droplets and is refracted again as it exits, creating the spectrum of colors observed in a rainbow.

33.

Marking Scheme



3 Min

☞ Correct formula and substitution: (1 M)

☞ Final correct answer: (1 M)

For concave mirror, Given;

Radius of curvature (R) = -20 cm

Object distance (u) = -15 cm

Focal length (f) = $\frac{R}{2} = -\frac{20}{2} = -10$ cm

Using the mirror formula: $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

$$\frac{1}{-10} = \frac{1}{v} + \frac{1}{(-15)}$$

$$\frac{-1}{10} = \frac{1}{v} - \frac{1}{15} \Rightarrow \frac{-1}{10} + \frac{1}{15} = \frac{1}{v}$$

$$\frac{-15+10}{150} = \frac{1}{v}; \frac{-5}{150} = \frac{1}{v} \Rightarrow v = -30 \text{ cm}$$

Therefore, the image distance is 30 cm.



Mistakes 101 : What not to do!

- ❑ Incorrect sign convention for object distance (u) and focal length (f).
- ❑ Incorrect substitution of values in the mirror formula.
- ❑ Incorrect calculation of the image distance (v) using the mirror formula.

34.

Marking Scheme



4 Min

☞ Identifying the correct formula and understanding of ratios: ($\frac{1}{2}$ M)

☞ Calculating the area ratio correctly: ($\frac{1}{2}$ M)

☞ Substituting values into the resistance formula and calculating the final ratio: (1 M)

(A) We known, $R = \frac{\rho L}{A}$; $\therefore$ Resistance of a wire is

directly proportional to its length and inversely proportional to its cross-sectional area.

Given, the lengths are in the ratio of 1:2, and diameters are in the ratio of 2:1.

Hence, cross-sectional areas are in the ratio of = 4:1.

Therefore, the resistance ratio is

$$\frac{R_1}{R_2} = \frac{l_1}{l_2} \frac{A_2}{A_1} = \frac{1}{2} \times \frac{1}{4} = 1:8.$$

OR

Marking Scheme



4 Min

☞ Correct formula and substitution: (1 M)

☞ Final correct answer: (1 M)

(B) Using Ohm's Law, $V = IR$

where V = potential difference, I = current, and R = resistance

Substituting the given values, we get:

$$V = 2\text{ A} \times 10\Omega = 20\text{ V}$$

Therefore, the potential difference across the wire is 20 V.



Mistakes 101 : What not to do!

- ❑ Incorrect understanding of the relationship between resistance, length, and cross-sectional area of a wire.
- ❑ Incorrect calculation of the cross-sectional area ratio.
- ❑ Incorrect calculation of the resistance ratio using the length and cross-sectional area ratios.

35.

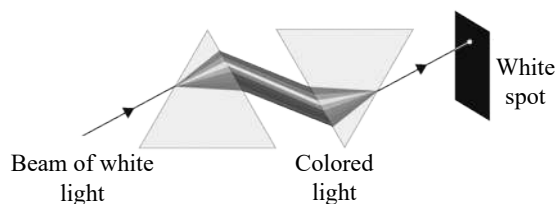
Marking Scheme

7 Min

- | | |
|---------------------------------------|-------|
| ☞ Cause of dispersion: | (1 M) |
| ☞ Explanation of Newton's experiment: | (1 M) |
| ☞ Correct and labeled ray diagram: | (1 M) |

When white light passes through a prism, different colours of light bend at different angles due to different refractive indices of the glass for different colours. As a result, the white light splits into its constituent colours. This phenomenon is called dispersion.

Newton showed that white light is made up of seven colours using two identical glass prisms in an inverted position. He dispersed the white light using the first prism and recombined it using the second prism. The recombined white light had a coloured fringe with seven colours—red, orange, yellow, green, blue, indigo and violet.

**Topper's Explanation**

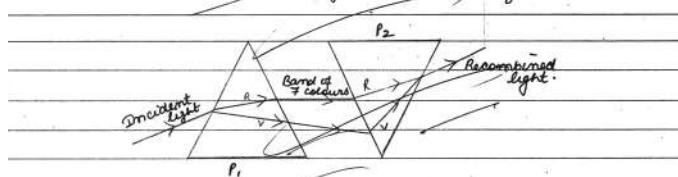
(CBSE 2017)

→ Cause of Dispersion of white light by a glass prism →

When white light ray passed through a glass prism, its constituents colours having different wavelengths & speeds, bend or deviate at different angles due to which they get separated from each other. This happens due to peculiar shape of prism that different colours go in different directions.

Newton passed a ray of white light through a glass prism. After refraction, the white light splitted into its constituent band of seven colour called spectrum. When he tried to further split it by

placing a prism, it didnt occur. But when he placed an inverted prism and passed the band of colours through it, he saw white light ray coming from other side. Thus he concluded that sunlight is made up of seven colours.

**Mistakes 101 : What not to do!**

- ☐ Not mentioning that the cause of dispersion is refraction.
- ☐ Missing or incorrect ray diagram to show the path of white light through the prism combination.

36.

Marking Scheme

5 Min

- | | |
|--|---------------|
| ☞ Formula for Req in series and parallel: | (½ × 2 = 1 M) |
| ☞ Correct calculation of maximum resistance (1 M) | |
| ☞ Correct calculation of minimum resistance: (1 M) | |

We know that, equivalent resistance is maximum when resistors are in series combination

$$\frac{1}{5}\Omega \quad \frac{1}{5}\Omega \quad \frac{1}{5}\Omega \quad \frac{1}{5}\Omega \quad \frac{1}{5}\Omega$$

equivalent resistance in series is given by

$$R = R_1 + R_2 + R_3 + R_4 + R_5$$

$$R = \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} = \frac{5}{5} = 1\Omega$$

Maximum resistance is 1Ω .

Minimum resistance when resistances are connected in parallel combination

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} + \frac{1}{R_5}$$

$$\frac{1}{R_{eq}} = \frac{1}{1/5} + \frac{1}{1/5} + \frac{1}{1/5} + \frac{1}{1/5} + \frac{1}{1/5}$$

$$\frac{1}{R_{eq}} = \frac{5}{1} + \frac{5}{1} + \frac{5}{1} + \frac{5}{1} + \frac{5}{1} \Rightarrow R_{eq} = \frac{1}{25}\Omega$$

Minimum resistance is $\frac{1}{25}\Omega$.

37.

Marking Scheme

4 Min

- | | |
|---------------------------------|-------|
| ☞ Identifying the material | (1 M) |
| ☞ Explaining two key properties | (1 M) |
| ☞ Additional properties | (1 M) |

The material commonly used for the filament of electric lamps is tungsten.

Tungsten is used almost exclusively because it has a very high melting point (about 3422°C) and can withstand high temperatures without melting.



Additionally, tungsten has good electrical resistance, which allows it to glow brightly and efficiently when an electric current passes through it. This makes tungsten ideal for producing light while ensuring the filament lasts a long time.

38.

Marking Scheme



15 Min

(a) Identifying the term (Parallel combination) (1 M)

(b) Correct calculation of resistance of E (2 M)

(c) Summing up currents to get the total (1 M)

OR

(c) Reason for resistance of ammeter is high/low (1 M)

(a) Resistors are attached in parallel

(b) Resistance of E = R_1

$$I = \frac{V}{R}$$

$$0.3 = \frac{6}{R}$$

$$R_1 = \frac{6}{0.3}$$

$$R_1 = 20 \text{ ohm}$$

(c) Total current (I) = $\frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$

$$= \frac{6}{20} + \frac{6}{10} + \frac{6}{5} = 0.3 + 0.6 + 1.2 = 2.1 \text{ A}$$

OR

(c) The resistance of an ammeter should be low because it measures the current in a circuit and need to be connected in series.

39.

Marking Scheme



17 Min

(i) Identifying the type of lens (Converging): (1 M)

(ii) Mentioning two optical instruments (2 M)

(iii) Explaining the three characteristics of the image with the concave mirror (2 M)

(A) (i) The given lens is a convex lens which is converging in nature.

(ii) (a) Camera, a converging lens is used to focus light and form a real inverted and diminished image of an object on the film or sensor.

(b) Human eye, it uses converging lens to form real, inverted image on retina.

(iii) For the given case, the object is placed between focus and pole of the Mirror.

Three characteristics of the image formed are

(a) Virtual (b) Erect (c) Enlarged

OR

Marking Scheme



17 Min

✓ Correct application of the mirror formula for the first end: (2 M)

✓ Correct application of the mirror formula for the second end: (2 M)

✓ Calculating the final length of the image correctly: (1 M)

(B) Given:

Length of the rod = 10 cm

Focal length of the concave mirror (f) = -10 cm (since it is concave)

Distance of the end of the rod closer to the pole from the mirror (u_1) = -20 cm (object distances are taken as negative in mirror calculations)

The other end of the rod will be at a distance (u_2) = -20 cm + 10 cm = -30 cm

Using the Mirror Formula:

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

Let's calculate the image distances for both ends of the rod.

Image distance for the closer end (v_1):

$$\frac{1}{-10} = \frac{1}{v_1} + \frac{1}{-20}, \quad \frac{1}{v_1} = \frac{1}{-10} + \frac{1}{20}$$

$$\frac{1}{v_1} = -\frac{1}{10} + \frac{1}{20}, \quad \frac{1}{v_1} = -\frac{1}{20}$$

$$v_1 = -20 \text{ cm}$$

Image distance for the farther end (v_2):

$$\frac{1}{-10} = \frac{1}{v_2} + \frac{1}{-30}, \quad \frac{1}{v_2} = \frac{1}{(-10)} + \frac{1}{(-30)}$$

$$\frac{1}{v_2} = -\frac{3}{30} + \frac{1}{30}, \quad \frac{1}{v_2} = \frac{-3+1}{30}$$

$$\frac{1}{v_2} = \frac{-2}{30} = \frac{-1}{15}$$

$$v_2 = -15 \text{ cm}$$

Length of the image:

The length of the image of the rod will be the absolute difference between the two image distances:

$$\text{Length of the image} = |v_1 - v_2|$$

$$= |-20 \text{ cm} - (-15 \text{ cm})|$$

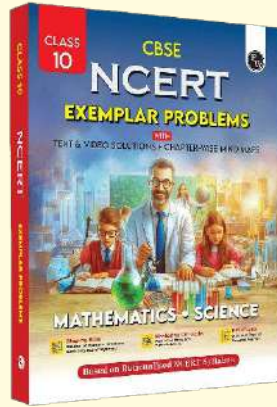
$$= |-20 + 15| = |-15| = 5 \text{ cm}$$

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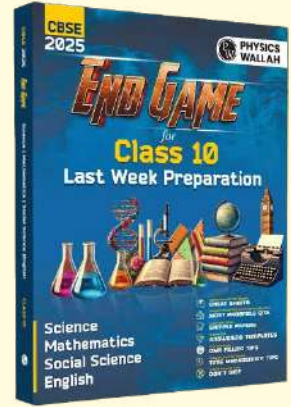
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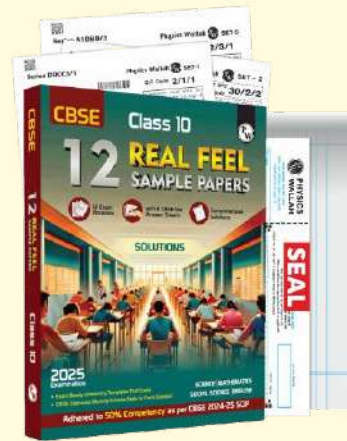
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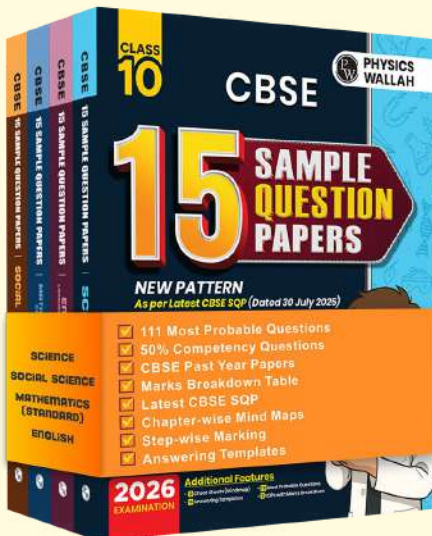
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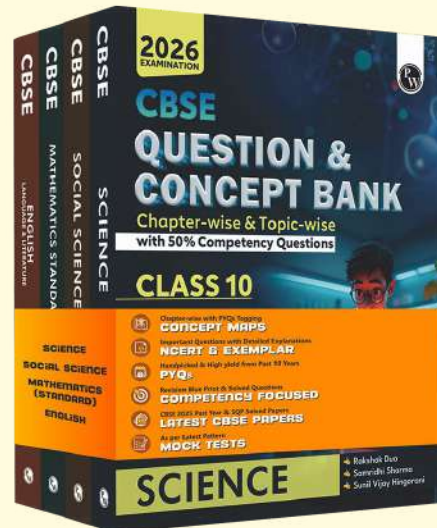
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